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MILITARY AFFAIRS

AVIATION AND COSMONAUTICS

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USSR REPORT

MILITARY AFFAIRS

AVIATION AND COSMONAUTICS

No 8, August 1986

Except where indicated otherwise in the table of contents the following is a complete translation of the Russian-language monthly journal AVIATSIYA I KOSMONAVTIKA published in Moscow.

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AIR FORCE COMMANDER IN CHIEF ON MEANING OF AIR FORCE DAY

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 8, Aug 86 (signed to press 3 Jul 86) pp 1-3

[Article by twice Hero of the Soviet Union Mar Avn A. Yefimov, commander in chief of the Air Forces and deputy minister of defense USSR, delegate to the 27th CPSU Congress: "Winged Pride of the Homeland"]

[Text] This year USSR Air Force Day is notable by the fact that Soviet citiens are working enthusiastically on implementing a program to speed up our country's socioeconomic development, a program ratified by the 27th CPSU Congress. One observes in workforces and military collectives a process of renewal and radical reforms which is going through people's minds and hearts, demanding a full effort on the part of each and every individual.

The thoughts and deeds of Air Forces personnel, the designers and builders of our formidable fixed-wing and rotary-wing aircraft are filled with strong, businesslike, enthusiastic willingness. The scale and originality of the work in which they have been engaged since the historic 27th CPSU Congress requires a specific, correct understanding and a prompt, timely solution to new problems, as well as a radical break with previous thinking stereotypes. It is important at all levels closely to appraise the actual state of affairs with a critical party eye, to achieve a substantial change in training and performance of duties, and to reject everything which impedes forward movement -- we in the Air Forces should view this as an important reserve potential for transforming the energy of plan and intention into the energy of concrete deeds.

Our highest party forum provided answers to root questions formulated by practical realities and armed each and every Soviet citizen with a profoundly scientific program of precise actions and specific tasks. It confirmed with renewed emphasis the correctness and timeliness of the action taken by the CPSU Central Committee, presenting at its April (1985) Plenum a general plan for accelerating this country's socioeconomic development.

The achievements of the Soviet Union in the economic, social and intellectual domains are well known. One cannot denigrate our successes. Building on these successes, however, we must today advance considerably more rapidly, resolutely eliminating bottlenecks, working persistently to overcome phenomena

of stagnation, and correcting miscalculations and deficiencies which have occurred in the past.

A fresh wind of important changes is creating that special climate in which no member of the Air Forces can rest on his laurels or fail to display self-sacrifice and diligence in mastering complex combat equipment, in improving his air, weapons, and tactical proficiency, and in further increasing the combat readiness of Air Forces units and subunits.

A decisive element in these changes is the human factor, a point which was persuasively made by speakers at the congress. "In the final analysis," emphasized CPSU Central Committee General Secretary Comrade M. S. Gorbachev, "the success of our entire efforts to embody the general policy line of the 27th CPSU Congress will be determined by conscious participation by the broad masses in building communism."

The June (1986) Plenum of the Central Committee of the Communist Party of the Soviet Union became an important instrument in implementing the party's strategy which was spelled out at the 27th CPSU Congress; the Plenum discussed measures pertaining to the State Plan of Economic and Social Development of the USSR for 1986-1990 and the tasks of party organizations connected with its implementation, as well as the results of the meeting of the Political Consultative Committee of Warsaw Pact member nations, held in Budapest on 10-11 June 1986.

The Leninist Party has called upon Communists and all Soviet citizens to become actively involved in implementing the grandiose plans of improving the Soviet society, in renewing and refurbishing our socialist home. Air Forces personnel are greeting their traditional national holiday with an affirmative, businesslike attitude. USSR Air Force Day is a military review, as it were, of the achievements of Soviet aviation science and technology, the successes of flight and engineer-technician personnel, as well as of the multimillion-member body of DOSAAF aviation sports enthusiasts.

Each year we recall with pride on this important holiday how our military aviation -- an offspring of Soviet rule -- and its heroic history began with the famed shot fired by the illustrious "Aurora."

V. I. Lenin, leader of the proletariat, perspicaciously defined the role and significance of aviation in defending the young Soviet Republic and the sacred cause of the October Revolution. On the third day following capture of the Winter Palace, on 10 November, he signed an order establishing an office of commissars of aviation and lighter-than-air aeronautics as well as organization of the first socialist aviation detachments. We are justly proud of the fact that the great leader and ingenious strategist of the proletarian revolution was involved in the beginnings of our Air Forces. Following his instructions and behests, our country was transformed into a mighty air power during the years of Soviet rule.

In the course of the Civil War the fighting traditions of the Red Air Force were born and grew strong, and the finest qualities of Soviet aviators were formed: total dedication to the ideals of Marxism-Leninism, to the socialist

homeland, to our heroic people, revolutionary vigilance and iron discipline, unwavering staunchness and courage, a high degree of flying skill, initiative and daring in combat.

The Leninist Party, proceeding with peacetime construction and mobilizing the Soviet people to implement the grandiose plans of socialist transformation of the economy, took all measures to accomplish further strengthening of the defense capability of the homeland and technical equipment of its valiant Armed Forces. During these years organizational development of the Soviet Air Force took on a broad scope and became truly the business of the entire people.

A Leninist policy of national industrialization and labor exploits by the Soviet people on the construction projects of the first five-year plans made it possible to build in an unprecedentedly short time a strong material and technological foundation for rapid growth and development of Soviet aviation. The USSR Air Force was surely and confidently gaining strength, its wings becoming more powerful with each passing year. The striking power of our Air Forces was experienced in full measure by fanciers of military adventures in the combat at Lake Khasan and on the Khalkhin-Gol River. Soviet pilots, faithful to their internationalist duty, fought courageously in the skies over revolutionary China and Republican Spain, displaying models of heroism, the highest level of courage and unshakable fortitude.

The finest qualities of Soviet airmen were particularly vividly revealed during the grim years of the Great Patriotic War. From the very first hours of fighting, intrepid Soviet fliers from all air components displayed a high degree of organization and discipline as well as unparalleled courage. Our people will remember forever the names of fearless Soviet aces A. Pokryshkin and B. Safonov, I. Polbin and S. Suprun, G. Kravchenko and N. Gastello, Z. Sorokin and V. Talalikhin, as well as many thousands of others who by their deeds and exploits brought fame to the socialist homeland and our valiant Air Forces. The present generation of military airmen is proud of the courage and brilliant victories won in the skies during the Great Patriotic War by I. Kozhedub and N. Skomorokhov, A. Smirnov and V. Popkov, A. Vorozheykin and P. Taran, A. Maresyev and M. Devyatayev, who fought selflessly and fearlessly against the fascist invaders.

The know-how, tactical and weapon proficiency of the winged defenders of the homeland grew from one engagement to the next in the flames of battles of unprecedented scale; the operational-tactical skills of aviation commanders became improved and finely honed, and the effectiveness of party-political work in aircrews, squadrons and regiments increased. Aviation headquarters staffs also made a substantial contribution toward directing units and combined units in a combat environment.

Combat aircraft designed by gifted Soviet aircraft designers made a large contribution toward achieving steady increase in the combat power of our Air Forces, toward gaining and firmly holding air supremacy right up to the total defeat of Fascist Germany. The workers of the aircraft industry accomplished a great feat, furnishing the fighting forces with more than 100,000 outstanding aircraft during the war years. Therefore, in celebrating USSR Air

Force Day, airmen speak with gratitude the names of outstanding Soviet designers A. Tupolev, S. Ilyushin, V. Petlyakov, V. Yermolayev, S. Lavochkin, N. Polikarpov, A. Mikoyan, A. Yakovlev, A. Mikulin, V. Klimov, A. Shvetsov, and other creators of first-class weapons of victory.

The Leninist Party and Soviet Governnment had high regard for the combat exploits of military aviation personnel during the Great Patriotic War. Many thousands of distinguished commanders and political workers, pilots and navigators, aerial gunners, engineers and technicians, ground specialist personnel, and Air Forces rear services personnel were awarded coveted government decorations. The most distinguished units and combined units were awarded the guards appellation, received decorations and honorary name designations. The Soviet people will never forget the combat exploits of their winged fellow countrymen and sacredly cherish the memory of those who perished in battle for the honor, freedom, and independence of the socialist homeland.

The postwar period brought a qualitatively new phase in the development of our Air Forces. The country still lay in ruins, but Soviet pilots had already proceeded to work on mastering jet aircraft. At the official 1947 May Day celebration, Muscovites and visitors to the capital thrilled at the sight of Yak-15 and MiG-9 combat aircraft streaking over Red Square.

Almost 40 years have passed since that signal event. During this time, thanks to constant concern on the part of the Communist Party and selfless labor by the Soviet people, our Air Forces have gone through several generations of fixed-wing and rotary-wing aircraft. During these years weapons as well as flight operations control and support facilities have become more sophisticated. As a result the combat potential of the Soviet Air Forces has increased substantially, and their tactical-technical capabilities to carry out difficult, critical missions connected with reliably defending the achievements of socialism, particularly ensuring the security of our homeland, have expanded.

Today's aircraft is a synthesis of the latest achievements and discoveries of Soviet science and technology, a powerful, formidable weapon capable of successfully accomplishing diversified combat missions.

Design teams headed by R. Belyakov, A. Tupolev, G. Novozhilov, G. Svishchev, M. Tishchenko, N. Kuznetsov, and others have made a weighty contribution toward the development of the latest generations of modern fixed-wing and rotary-wing aircraft. They are continuing in a worthy manner the finest traditions of their senior comrades and mentors, who developed during the postwar period outstanding jet-propelled fixed-wing aircraft, helicopters, and aircraft powerplants.

Our courageous test pilots have also made a large contribution toward providing the Soviet Air Forces with modern hardware. It was they who gave the nod of approval to series production of aircraft which were later flown by line-unit pilots, displaying examples of conscientious performance of job-related duties, efficiency and discipline.

Our military aviation served as the cradle of the space program. This year the manned space program marked its 25th anniversary. The first man to fly in space was a citizen of the Union of Soviet Socialist Republics, party member officer Yu. A. Gagarin.

An innovative search is in progress in Air Forces units and subunits for the most effective methods of training and indoctrinating aviation personnel and improving training facilities. The skill of aircraft commanders, flight and squadron commanders, staff officers and officers of command facility teams pertaining to tactical control with utilization of automated control systems is being improved in the course of tactical air exercises and live-fire range activities. Unfortunately, some tactical air exercises have been conducted in an uninstructive manner. At times the air environment during such exercises has failed fully to correspond to the possible nature of actions by the potential adversary, and there have been deficiencies in organization and execution of precise coordination between subunits and units. Serious conclusions must be drawn from the shortcomings and ways specified for correcting them in a decisive manner. Each and every commander, political worker, and staff officer, every trainer and flight operations officer should critically assess and improve his instruction methods, seek to achieve high-quality accomplishment of training curriculum and schedule, have the ability to use in an integrated manner the vast arsenal of teaching devices, methodological recommendations and teaching devices, and make a determined effort to adopt all new and progressive innovations.

The constantly growing complexity of aircraft is increasing the interlinkage between the degree of mastery of an aircraft by flight personnel, engineer and technician personnel, and its effective employment in combat. Here too one of the important indicators of the purposefulness of training is level of knowledge, determined by an airman's proficiency rating. Paramount importance is attached to boosting proficiency ratings in line units. It is important to bear in mind the fact that in conditions of accelerated scientific and technological advance in military affairs, standards-meeting requirements for determining proficiency rating should regularly be made more difficult.

Unfortunately one sometimes encounters the situation where a proficiency-rated airman, while having thoroughly studied the construction and operation of airborne systems and weapons as well as the performance data on a fixed-wing or rotary-wing aircraft, has poor knowledge of the methods of optimal employment of such a system in combat, in a specific tactical situation. Recently an inspection to determine the level of proficiency of the pilots in a certain unit revealed that some of them possessed poor knowledge of the comparative performance characteristics of offensive air weapons and of their own aircraft, as well as the most advantageous modes of combat employment of fighter-bombers. Of course these are intolerable deficiencies in pilot tactical training, which cannot be accepted under any circumstances.

An officer's professional competence is manifested most vividly in combat, during tactical air exercises and during flight operations, as well as in a difficult, extreme situation, when resourcefulness, courage, determination, will and self-control are demanded of him. This has been demonstrated time and again by Soviet airmen serving with the limited Soviet forces in

Afghanistan. The homeland has appropriately honored the courage and great fighting skill of Communist-airmen V. Gaynutdinov, Ye. Zelnyakov, N. Kovalev, V. Kot, V. Pavlov, V. Pismennyy, P. Ruban, and V. Shcherbakov, awarding them the title Hero of the Soviet Union. Many Air Forces personnel have been awarded Soviet Government decorations as well as decorations of the DRA. Their example of strong integrity and responsibility, professional expertise and a hardworking nature, initiative and innovativeness, personal discipline and closeness to their men mobilizes young Air Forces personnel to storm new heights of combat maturity.

We are presently at a critical juncture, and the following conduct on the part of each and every leader-officer is appropriate at this point: just as in battle he who calls upon others should himself be ready and willing to lead the attack, so during our busy days of intensive work he who calls upon his men to reorient themselves must himself be the first to display an example in the campaign against everything obsolete and outmoded, against everything which hinders us from achieving substantial results in flight training with the least expenditure of materiel and equipment.

This is precisely how party member Col A. Labkovskiy, commander of a Red-Banner guards bomber regiment and delegate to the 27th CPSU Congress, conducts himself. The initiators of socialist competition in the Air Forces have set for themselves an important goal -- continuously to maintain a high level of combat efficiency and maximally to utilize the combat capabilities of modern aircraft equipment to accomplish further improvement in military skill and combat readiness. They value every minute of training time, efficiently utilize flight operations shifts in improving the proficiency of aircrews, appraise achieved performance levels in an exacting manner, work uncompromisingly to overcome shortcomings and errors of omission, and hold strictly to account Air Force personnel who are guilty of unnecessary situation simplification, predictable routine and unnecessary relaxation of demands in training and indoctrination of subordinates. They work with determination to halt the actions of those persons in authority who attempt to rationalize their mistakes and shortcomings with a subjectivistic approach as various promises and empty talk.

I believe that this is the essence of reorganizing the work style of our commanders, political agencies, staffs, party and Komsomol organizations in light of the tough demands of the 27th CPSU Congress. The line of conduct for each and every airman is quite clear: less talk and verbal assurances and more specific actions promoting successful accomplishment of the difficult tasks assigned to every military collective. The CPSU Central Committee calls for action in this vein, and the USSR Minister of Defense is demanding it of us.

That day when the results of the training year will be totaled up is not far off. A critical, decisive period in flight training has begun, when commanders, political agencies, staffs, party and Komsomol organizations must concentrate the attention of Air Forces personnel on full, high-quality accomplishment of combat and political training schedules, attaching great importance to complex types of aircrew training. This means that it is essential right today, in every regiment and squadron, every aircrew, flight, detachment, and support subunit, to analyze what has been accomplished and

what still remains to be accomplished, first and foremost taking into account deficiencies and mistakes occurring in past years.

Time is of the essence. Time is especially precious to us military men. The time has come to see what we have achieved in improving professional expertise, in strengthening discipline and organization, in increasing vigilance and combat readiness, what we have learned in the year of convocation of the 27th CPSU Congress, and how we are meeting our pledges in the first year of the 12th Five-Year Plan.

The fall-winter period, the most critical phase in troop combat training, is not far off. We must prepare for it thoroughly and in a prompt and timely manner. In connection with this we must carry out an entire aggregate of the most diversified measures connected with improving facilities at Air Forces garrisons, efficient operation of airfields, preparation of aircraft and motor vehicles for the winter season, and improvement of training facilities. All this is directly related to combat readiness and precision organization of flight operations without mishaps and mishap-threatening situations.

Commanders, political agencies, staffs, officers of Air Forces rear services agencies, party and Komsomol organizations should address all these matters in a most serious manner, displaying proper persistence, initiative, demandingness and integrity in settling them affirmatively and promptly. We should not forget that successful and high-quality accomplishment of tasks in the new training year -- the year of the 70th anniversary of the Great October Socialist Revolution -- will depend in large measure on this.

Nevertheless, in analyzing progress in the combat training of Air Forces personnel, meeting with unit and subunit commanders, and studying the state of affairs in military collectives, one readily concludes that in some outfits one still senses a lack of intensity, and in some cases there has been failure to eliminate the party-condemned "paper" style of leadership of personnel, units and subunits, to eliminate unnecessary relaxation of demands and situation simplification in combat training, and excessive attention to form with consequent detriment to content in organization of socialist competition.

Such leader personnel unquestionably lack a valuable quality, consisting in precise coordination of the efforts of military collectives, the ability thoroughly to analyze the state of affairs in a unit and subunit, to make objective appraisals, to see possibilities and unused potential for overcoming deficiencies and errors of omission. The 27th CPSU Congress focused all party members precisely on businesslike efficiency, specificity, vigorousness and demandingness in comparing achieved performance.

In my opinion the attention of commanders and superior officers should be properly directed toward these issues in preparing efficiency reports on Air Forces officer cadres, a process which has entered a decisive phase.

An enormous role in successful, high-quality accomplishment of tasks assigned to Air Forces personnel is played by firm military discipline, which greatly influences the degree of job proficiency of Air Forces personnel and characterizes their political maturity and ideological conviction. It

determines in large measure the quality of combat training, successful mastery of modern aircraft, flight safety, as well as the moral-ethical atmosphere in every military collective.

At the present time one of the most important tasks of commanders, political agencies, staffs, and party organizations is to utilize all capabilities available in our arsenal for further strengthening organization and order as well as strict observance of the requirements of regulations. And this requires a response not limited to discussion and appeals, but effective examination and thorough analysis of the cause of violations committed by certain military personnel, and the taking of vigorous, specific measures with the active involvement of the military community. Communists -- the party's political warriors -- are called upon first and foremost to display persistence and personal example in this area. They bear personal responsiblity for this to the CPSU and its Central Committee.

This year the Soviet people are celebrating USSR Air Force Day in a tense international atmosphere. Resorting to demagoguery and displaying adventurism in international relations, imperialist reaction, headed by the present U.S. Administration, is doing everything it can to reject important and very timely peace initiatives on the part of our country. It is continuing its dangerous militaristic course of policy, escalating to another round in the arms race, extending it to more and more new domains. We are witnesses to the fact that imperialism attempts to utilize every scientific discovery first and foremost to develop new weapons of death and is actively engaged in preparations for "star wars," which makes the arms race even more dangerous for all mankind.

Recent events in the world compel us to be on guard, to display the highest degree of vigilance, to maintain a constant state of combat readiness.

Air Forces personnel unanimouosly approve of and support the domestic and foreign policy of our Leninist Party, the peace initiatives and specific nuclear missile arms reduction proposals contained in the 15 January statement by CPSU Central Committee General Secretary Comrade M. S. Gorbachev and his address broadcast over Soviet television on 14 May 1986.

Faithful to their patriotic and internationalist duty, continuing the heroic traditions of the war veterans, and utilizing the invaluable combat experience of the war veterans, Air Forces personnel are ready at all times to carry out any task assigned by the Communist Party and Soviet Government pertaining to defending the achievements of socialism and the peaceful, constructive labor of our people and the brother countries of the socialist community.

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IMPORTANCE OF COMBINING THEORY, PRACTICE IN TRAINING

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 8, Aug 86 (signed to press 3 Jul 86) pp 6-7

[Article, published under the heading "Be Alert, In a Continuous State of Combat Readiness," by Honored Military Pilot USSR Col Gen Avn A. Borsuk, deputy commander in chief of the Air Forces for combat training: "Both Theory and Weapons"]

[Text] Scientific and technological advances are exerting decisive influence on all domains of economic development and the sociopolitical activities of society, including military affairs. The coming into operational status in line units of new combat equipment and weapons causes changes in military art, especially in tactics, its most fluid segment.

As a component part of military art, tactics encompasses theory and the practical conduct of combat. At the same time the diversity of forms and modes of air combat operations does not fit neatly within the classic definition of tactics. While theory investigates the mechanisms, nature and content of combat and elaborates the modes of preparation for and conduct of combat, practice encompasses the activities of commanders, staff officers, and flight personnel in situation study and detailing, planning, decision-making and assigning missions to subordinates, preparation for and conduct of combat operations, command, control and support of subunits in combat.

In addition to the conduct of air-to-air combat, however, air forces deliver strikes of various designation and conduct specialized combat flight activities. In the process of studying points of theory, commanders, staff officers, and flight personnel acquire the requisite knowledge for their practical application. In the course of specific, practical activities they acquire the skills, ability and experience connected with implementation of theoretical conclusions, calculations and recommendations directly in the air. Consequently air tactics include first and foremost theory and practice of execution of a combat flight regardless of its specific purpose.

As we know, combat flying consists of stages, which contain specific elements and separate events. Specific tactical devices and quite specific crew actions are characteristic of each phase, element, and event. For example, such specific procedures as takeoff by a single aircraft, in pairs or flights,

takeoffs with minimal time intervals, departure from the airfield with specific parameters as regards heading, altitude, and airspeed, subsequent join-up by various methods according to a scheme prescribed in advance, etc, are employed at the phase of takeoff and forming up. The techniques employed in this phase depend entirely on the commander's plan, the weather and tactical environment. Flight to the target or area of operations is also characterized by a diversity of techniques, which ensure concealment and the element of surprise in delivering a strike, with employment of military stratagem, by diverting the attention of hostile air defense assets and avoiding attack by hostile fighters. The most critical phase of combat flying is that of actions in an enemy deployment area or in the target area. The techniques, combat maneuvers and methods of affecting the enemy employed in this phase are distinguished by particular thoroughness of testing and verification and maaximum effectiveness. Piloting technique which has been honed to perfection ensures reaching the weapons delivery point and an assured target kill.

Flight from the target or disengagement is far from being such a simple phase as might seem at first glance. It is precisely during this phase,as is attested by the experience of the Great Patriotic War and local military conflicts unleashed by imperialism, that considerable combat losses have occurred. There are many factors involved, one of which is purely psychological: a relaxation by the aircrew, diminished alertness, and complacency. Under present-day conditions the importance of alertness, external visual observation, and airspace scanning has increased many times over, since the return flight also involves close coordination with friendly air defense assets.

During the phase of release from element formation, the landing approach and landing proper there are also specific features, particularly if the airfield is within the range of enemy fighters or other hostile weapons. In a combat situation standard approach configurations employed in peacetime conditions may prove totally unsuited. This means that aircrews should possess a mastery of various methods and accomplish expeditious landing.

All this signifies that aircrew tactical air training consists in studying and mastering the tactical devices of every phase and element of combat flying, not only those at which weapons delivery takes place. At the tactical level combat flying should be viewed as an integral process in which all specifically essential and probable actions logically interact.

The search for optimal variations of execution of combat flight with utilization of effective tactical devices and maneuvers naturally is inconceivable without thorough knowledge of the capabilities of the aircraft and its weapons as well as the specific features of the aircraft and weapons of the potential adversary. It is very important thereby to take into consideration the technical features of the weapons, aiming system, tactical control system, and the psychological fine points of the operational activities of aircrew, command and control facility team, or antiaircraft crews. In other words it is essential to know well both the equipment and human psychology. Without this it is useless to simulate or model flight in a tactical respect.

Today commanders, staffs, and flight personnel have the opportunity to utilize a complex mathematical edifice translated into computer language in planning combat flying and in calculating combat mission phases and maneuvers. The electronic computer has today become a true assistant to the commander, pilot, and navigator. It is a matter of honor for every Air Force officer to learn to use the computer purposefully in the combat training process.

Practical tactical air training has given us several ways to improve it. One of them is basic elaboration of points of theory and improvement in the content of the teaching methods arsenal. This is a very important and necessary area of activity, and there can be no doubts about this. As we know, however, theory without practice produces no benefit, particularly since we are talking about the application of theory in a combat environment. The experience of the last war attests to the fact that advantageous and, therefore, optimal maneuvers, techniques and modes of combat employment of new weapons and aircraft would be first tried out on the range and then tested and verified in combat, in conditions of actual enemy opposition. That which was unsuited would be rejected immediately, while all reasonable and rational innovations would be discussed and analyzed. Acquired experience would rapidly be disseminated among flight personnel. To accomplish this in battlefront conditions, command authorities would organize seminars and conferences for exchange of experience and know-how, in spite of the fact that little time was available. This experience and know-how would subsequently be synthesized, and recommendations in the form of special publications would be distributed to the line units.

It is generally said that if there is no enemy there can be no tactics. This is true. Nevertheless totally new tactical solutions and innovative actions may be demanded not only by a combat situation but also by an unconventional, emergency situation. Such was the case, for example, with the disaster at the Chernobyl nuclear power station. The aircrews of a guards helicopter regiment were assigned the mission to drop sand into the gaping hole where the roof of the reactor building had collapsed. Quite frankly, none of the helicopter crews had ever "bombed" with sandbags, nor were the helicopters rigged for such an activity.

In addition, the crews were faced by real danger: visible -- the fire, and invisible -- radioactivity. We should note that every individual has a well-developed sense of self-preservation, which exerts psychological pressure and sometimes inhibits the intellect and will. But the job had to be done. It had to be done quickly, with precision, and with maximum efficiency. The high degree of moral-political fortitude and psychological preparedness of the helicopter crews, a feeling of responsibility and a strong sense of civic duty, as well as profound awareness that they were the only ones who could handle the job were factors which came into play.

All flight, engineer, and technician personnel proceeded to look for optimal solutions. Of course under normal conditions the mission could have been modeled or simulated, and calculations could have been tested during training sorties to the range. But the aircrews could not permit themselves this luxury. Time was of the essence. Literally every minute counted. It was

necessary to act. For this reason the command authorities decided to conduct a flight experiment and test right in the air the correctness of the suggested plans. The aircrews displayed both technical inventiveness and a high degree of tactical proficiency. Air guidance control was set up in the immediate vicinity of the reactor. The controller corrected payload release on the basis of a series of reference points.

The initial runs showed that the selected method was highly effective. Officers A. Serebryakov and Yu. Yakovlev demonstrated fortitude, composure, and precision flying technique. Subsequently the method was improved. It was adopted by all aircrews. A genuine assault on the renegade reactor commenced, an assault which ended in victory.

The intense efforts in response to the disaster showed that our airmen are capable of handling unexpected situation changes in exceptionally difficult conditions. The experience gained by the helicopter crews should be thoroughly studied and synthesized not only by flight personnel, engineers and technicians, but also by support services specialist personnel and by aircraft designers and builders.

Unquestionably the evolution of aircraft and weapons exerts decisive influence on the evolution of tactics. But tactics also influences development of equipment. The helicopter is a remarkable product of man's intellect and hands. Flown by an expert, it is capable of performing the most varied tasks. But experience has shown that its effectiveness can be even greater: it is merely necessary to modify certain assemblies and improve the design. And the sooner this is done, the greater will be the aircraft's reliability and combat readiness. From the standpoint of tactics, the experience of the helicopter crews demonstrated the increased significance of the time factor. The situation demanded immediate and decisive actions. Under these conditions the regimental commander, Gds Col A. Serebryakov, succeeded in correctly focusing his men on accomplishment of a critical task and in organizing their labor in a precise manner. Special attention was devoted to innovativeness, initiative, and independence on the part of personnel. As we know, trust and confidence inspire people, greatly increasing their physical and moral energy. And this clearly paid off, for flight and technical personnel contributed a great many simple and innovative technical and tactical solutions.

The press of time also influenced the process of training and preparing crews for the job. Section commander Maj K. Dubinin, for example, who arrived at the base field at noon, needed only an hour for mission briefing and map familiarization. By nightfall his crew had made approximately 10 runs. This example once again confirms the truth of the statement that if people are fully aware of the seriousness and critical nature of the job they are assigned, they will do an excellent job.

Time moves swiftly forward. And he who is unable to value time and prize every minute inevitably becomes a slave to circumstances and falls behind in improving the level of his professional and tactical skills. Today the struggle for time is a struggle not only to gain a positional advantage and to gain the element of surprise -- a most important tactical principle. Intensification of the training process dictates the necessity of shortening

the time and at the same time improving the quality of training of Air Force specialist personnel of all categories, especially flight personnel. The adversary will not ask whether we are ready for combat. Today the aggressor, after making thorough preparations, attacks in a stealthy manner. This is precisely how U.S. air forces carried out the bandit attack on Libya, showing mankind the true value of the demagogic expatiations on peace by U.S. leaders. And yet what a vicious propaganda campaign the West waged over the events at the Chernobyl nuclear power plant. One of the aims pursued by Western propaganda is to divert the attention of the world community away from the bombing of Libyan cities, to direct world opinion down a phony channel. This technique is not new. Whenever an act of international brigandage has taken place, it has always been accompanied by an unbridled campaign of anticommunism and slander against peace-loving countries and the socialist community.

All this indicates that the aggressor is clever and cunning. His acts of political, ideological, and military provocation are supported by a vast propaganda edifice heavily engaged in juggling of facts, lies and slander. This too is tactics, but in the domain of politics, which in the world of capital serves the interests of the military-industrial complex.

In these conditions it is essential to maintain the highest vigilance, to keep a close watch on all the political, ideological and military intrigues of our adversaries. This means that, if they force us to fight, we shall have to fight with that arsenal of knowledge and skills which we possess at the moment the enemy attacks. With the swift pace of combat events, there will be no time to learn how to fight.

It is important to remember that the initial period is characterized by an extreme intensity of combat operations, since decisive objectives are being pursued. In connection with this, every military airman should be morally and professionally prepared to get himself and his aircraft quickly in a state of readiness to carry out assigned missions. Lt Col A. Kopytov's men, for example, devote constant attention to actions in conditions of an extreme shortage of available time, organization of teamwork and coordination with subunits of other air components and Ground Forces, perfecting methods of gaining the element of surprise in delivering airstrikes, effective techniques of penetrating air defense, as well as other items pertaining to specialized training. Tactical air training for combat aircrews is of an intensive, innovative nature. Each and every day of flying adds to their tactical arsenal and increases their combat proficiency.

It follows from this that theory of tactics should under no circumstances be separated from practical activities. In other words, military scientific establishments should constantly keep a finger on the pulse of Air Force unit activities, taking note of all new innovations which appear in tactics, in mastering the operation and combat employment of aircraft and weapons, studying these phenomena and providing them with scientific validation. Scientific recommendations in turn should be immediately studied in the units and incorporated into the training process. One should always bear in mind thereby that tactics is not simply theory and practice, but first and foremost a weapon, a powerful means of achieving victory over the enemy. A harmonious,

joint quest for effective methods and combat techniques, methods of training and indoctrinating Air Force personnel, as well as improving the level of professional expertise are seen as a powerful instrument for accelerating growth of combat proficiency and, consequently, combat readiness of Air Forces units and subunits.

There are no elements of secondary importance in tactical air training, nor can there be such elements. Everything about it is important. Nevertheless one still observes in some units and subunits complete omission of or lessened attention toward certain specialized subjects. Officer A. Arkadyev's men, for example, fly tactical drills in a simplified environment, and his men are not adequately briefed on their mission. It is therefore not surprising that they received low marks in the final performance evaluations. This indicates that some leader personnel, due to habit and established stereotypes of thinking and acting, either cannot or will not change. The process of reorientation which is presently taking place in every domain of our country's societal affairs has apparently not touched them. The most resolute measures of party and administrative influence must be applied to such leader personnel. Each individual should bear responsiblity for his own assigned area of work and should not pass the buck to others.

USSR Minister of Defense MSU S. L. Sokolov comments as follows: "It is exceptionally important for an officer to be prepared to assume the entire burden of responsibility for a decision. This is particularly essential in a combat environment, since one must answer not only for one's decisions but also for the outcome of battle and for the lives of one's men."

Concern about Soviet man, the builder of a new society, forms the basis of the social policy of our party and state. The Soviet Armed Forces are called upon reliably to defend the peaceful labor and peaceful life of Soviet citizens. "The party and government have endeavored and are endeavoring," it was noted in the CPSU Central Committee Political Report to the 27th Congress of the Communist Party of the Soviet Union, "to ensure that the Soviet serviceman -- both officer and enlisted man -- as he performs his difficult military service, always feels the concern and attention of society, to ensure that our military serves as a school for teaching civic responsibility, courage and patriotism." Responding to the party's concern, Air Forces personnel are working diligently to master combat equipment and weapons in conditions maximally approximating actual combat and to master the secrets of military skill, in order to be ready at all times to stand to the defense of their homeland.

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HELICOPTER PILOT IN COMBAT IN AFGHANISTAN

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 8, Aug 86 (signed to press 3 Jul 86) pp 8-9

[Article, published under the heading "They Were Decorated by the Homeland," by Col Ye. Besschetnov: "A Friend Will Lend a Helping Hand"]

> [Text] Party member Military Pilot 1st Maj P. Chindin, a student enrolled in the command faculty at the Military Air Academy imeni Yu. A. Gagarin, took part as a section commander and subsequently deputy commander of a helicopter squadron in rendering internationalist assistance to the people of the friendly country of Afghanistan in defending revolutionary achievements. This officer's courage and valor are attested by the coveted government decorations he has received -- the Order of Lenin and the Order of the Red Banner. The following article relates how Petr Ivanovich carried out his military and internationalist duty and ascended to the heights of military fame.

At dawn a force of Soviet assault troops, deployed near a mountain pass, encountered dushman [Afghan rebels], carrying supplies of weapons, who had crossed over the border into Afghanistan. A heavy firefight ensued. Three helicopters immediately took off for the conflict site, led by section commander P. Chindin. Petr Ivanovich was experienced in mountain flying and in teamwork with ground subunits.

As soon as they arrived at the site, they immediately proceeded to give our troops fire support. The fighting had been going on about 30 minutes when the voice of the commander of the assault troop force came over the radio: "Who can put down? We have a man with a serious stomach wound. He must be immediately evacuated...."

Handing over command of the helicopter element to Capt Mikhail Pyatibratov, Petr Ivanovich eased his ship over toward a rock cleft, to pick up the wounded trooper. The area was dotted with muzzle flashes. How could they rescue the wounded man? While his crew chief, acting as doorgunner, placed machinegun fire on the bandits, preventing them from putting aimed fire into the helicopter, Captain Chindin attempted to squeeze into the rock cleft. But it

proved to be so narrow that the slightest miscalculation could cause the aircraft to strike the rock faces -- the main rotor barely fit between them. He had to abandon his initial plan.

At such moments Petr Ivanovich always had the ability to think quickly, precisely, and make instant decisions. Sweeping the rocky terrain with his alert gaze, he spotted a small shelf about a hundred meters further down the narrow gorge. This flat area was also strewn with rocks, but the gorge walls receded from one another at that point, and there was a possibility to maneuver.

"Get the wounded man down to that shelf!" Chindin ordered the commander of the assault troop element. "And give me covering fire."

Sparingly expending their ammunition, which was running low, from time to time the crew returned dushman fire. The pilot eased his ship down toward the selected site. The fuel gauge caught his eye. The needle was close to empty. Maybe it was a good thing that most of his fuel was already burned off: the appreciably reduced weight would enable him to come in steep....

Privates and sergeants, staying behind boulders for protection against bandit fire, carried the wounded man down. Chindin, displaying expert flying technique, placed the helicopter's left gear on one of the large rocks and held it in this position by applying his brakes and adjusting rpm until the wounded soldier had been brought aboard. The helicopter lifted off. The pilot now had one concern: was there enough fuel to make it back home, or would they have to make a forced landing in the mountains? This would be hazardous and, most important, would mean losing considerable time.

He and his copilot-navigator quickly calculated optimal engine settings and, swinging around mountain peaks under cloud cover, the pilot headed back toward the "tochka" [airfield] by the shortest route. Concerned about the wounded man, from time to time Chingin asked the flight technician [crew chief]: "How's he doing?"

"Not too good.... But he is conscious. And he is doing his best to make it."

Petr Ivanovich radioed the tower in advance to have a standby helicopter ready, stressing that time was of the essence. As soon as Chindin taxied to the ramp, several men ran up to his helicopter. They quickly transferred the soldier to Capt Anatoliy Kivalkin's Mi-24, and the latter immediately took off.

Although that day was an extremely busy, difficult one for Captain Chindin and his comrades in arms, the airmen kept thinking about the wounded assault trooper. Would he make it? How was he feeling? Toward evening they learned that Kivalkin had delivered him to a military hospital. They had made it in time! If it had taken another hour and a half to two hours, the soldier would not have survived. Now the most critical moment was behind them. Soviet doctors were now involved in the efforts to save the soldier's life. Petr Ivanovich felt a sense of satisfaction: part of the effort had been his

contribution. He and his crew had not taken that risk in vain, picking up the wounded assault trooper under dushman fire.

This is just one of many of Chindin's experiences during his tour of duty in Afghanistan. One can state without exaggeration that virtually each and every sortie to give internationlist asssistance to the people of this country demanded boldness, courage and valor of him and his crew, and they logged hundreds of hours in the skies over the DRA, more than 500 very difficult takeoffs and landings.

...One more calamity was added to the regular hit-and-run attacks by dushman bands: high water in the mountains had swept away several bridges and washed out sections of road. The residents of a small village were cut off from the outside world. They were running short of food supplies and had no light or heat. Petr Ivanovich led an element of heavily-loaded helicopters tasked with flying in flour, salt, cooking oil, warm clothing, and other necessities. Arriving over the kishlak [village], they could find nowhere to put down: the ground was covered everywhere by a thick layer of alluvial mud. Chindin spotted a small site on a rise, and put his ship down. He inspected the mountain slope and helped the other aircrews choose a landing site. He then organized unloading of supplies. The residents of the kishlak were so happy to receive aid from the Soviet airmen! Petr Ivanovich long remembered the sensation of the dry, calloused palm of an elderly Afghan who, uttering words of gratitude, kept shaking his hand; he remembered the joyous sparkle in the dark eyes of the little children.

+fter unloading the supplies, Chindin organized assistance to the villagers in rebuilding and repairing bridges and the road. The airmen worked together with the Afghans, dragging heavy rocks, carrying crushed rock, and tamping down the roadbed. They even began competing with one another to see who accomplished more. A common field kitchen was set up for the helicopter crews and villagers. And when distant stars began to appear as night fell, they all watched a Soviet movie.

They left the kishlak on the following day. Petr Ivanovich, bidding farewell to the Afghans who had come to see them off, saw friendly faces and kind smiles, and was glad....

On numerous occasions sorties flown in the skies over Afghanistan tested Maj P. Chindin's stamina, combat proficiency, and courage. And Petr Ivanovich always displayed solid moral-fighting and psychological qualities, displaying models of excellent professional skill and the ability brilliantly to accomplish the most difficult air missions.

On one occasion, working in coordination with a ground subunit which had been forced to engage a dushman band which had crossed into Afghanistan, totaling about 50 men, Captain Chindin came under intense heavy-caliber antiaircraft machinegun fire. His helicopter was seriously damaged. The situation was becoming quite critical. Very likely nobody would have faulted the pilot if he had broken off combat at this moment. Petr Ivanovich, however, realizing how essential reliable air support was to the motorized riflemen, quickly assessed the situation and kept fighting. The helicopter was difficult to

control, but it was still flyable. In spite of the mortal danger, he continued hitting clusters of bandits. Subsequently, the following statement would appear in this officer's citation accompanying a government decoration: "Displaying a high degree of flying skill, courage, self-sacrifice and tenacity, Captain Chindin successfully accomplished his combat mission and brought his helicopter down safely." His bold, determined actions in the air were cited as an example to the rest of the men in the subunit.

Also indelibly imprinted in Petr Ivanovich's memory were flights to assist a Soviet assault element on Mach-An Pass, where a large dushman band had crossed over onto DRA soil. Afghan state security officers, interrogating members of a bandit advance reconnaissance party captured shortly before this, ascertained that within the next three days a unit several hundred men strong was supposed to be crossing over from Pakistan into Afghanistan.

The first two days things were quiet in the pass. What would the next day bring?

Three aircrews, led by Captain Chindin, took off at dawn and headed for the pass. The weather had deteriorated considerably. Clouds had built up, developing into a solid, gray overcast. Distant rock cliffs were wreathed in a bluish haze, and rock pinnacles disappeared into the clouds. Petr Ivanovich peered intently at the panoramic vista which was opening up before them.

There was Mach-An Pass out ahead, with an elevation of about 5,000 meters at the summit. The ground rose at a 50 degree gradient from the border, and on this side of the summit dropped off sharply, plunging toward the Kharb gorge, down which coursed a swift mountain stream. Petr Ivanovich immediately spotted the wide strip of tamped-down snow stretching across the entire pass. There was no doubt about it: a large group of people had passed here. Of course it could not have been peaceful dekhkans [peasants] or herdsmen. What would they be doing here early in December? He instructed his wingmen -- Capt Mikhail Pyatibratov and Capt Valeriy Kozlov -- to be fully alert, while he tried to figure out where the band could have gone. There was not a soul in sight.

They swung over the pass and proceeded along the gorge. In places it opened up to a width of as much as 4 kilometers, but in other places it narrowed down to as little as 800 meters. Everything was covered with snow along the banks of the mountain stream, and the trail still showed fairly clearly, leading ever deeper into Afghanistan.

On a nearby plateau, where the gorge opened up, the aircrews almost simultaneously spotted dark flecks on the snow. What was it -- livestock, people, or perhaps projecting rocks? On the leader's command they proceeded to orbit to the left at a height of about 400 meters and attempted to make out just what they were looking at. They could not figure it out, however.

Instructing his wingmen to cover him, Petr Ivanovich dropped lower. Soon Komsomol member mechanic A. Nikonov, who was flying with his aircrew, spotted below what looked like swift movement from one dark spot to the next, and Petr Ivanovich spotted a summer-pasturage livestock enclosure fenced by a stone

wall. He also saw several dark spots on the snow by the enclosure. He concluded that it was something covered by a cloth or tarpaulin, possibly weapons and ammunition delivered by the band. Before he had regained altitude, he saw muzzle flashes below: dushman were firing at his helicopter. Almost immediately rocket bursts threw up showers of snow. His wingmen were returning the bandits' fire, covering their leader. Soviet assault troops were already on their way to the area.

Orbiting overhead, the helicopter crews fired rocket salvos and placed machinegun fire into those locations from which dushman were firing at them.

The band numbered at least 200 men, a larger force than they could handle. Captain Chindin made radio contact with the senior commander [probably regimental CO] and reported the situation.

"Request you send up another element!" he radioed.

When the three helicopters (two Mi-8s and one Mi-24), led by Capt Andrey Novikov, joined battle, Chindin's element, having expended its ammunition, headed for home. Ground personnel quickly serviced the gunships, fueled them, rearmed them, and the helicopter crews took off and headed out once again....

All day helicopter crews, relieving one another, provided solid air support for the Soviet ground soldiers, who bottled up the band until Afghan infantry arrived to finish them off. It was a long and intense battle, which ended in victory: the guns of more than 200 bandits were silenced. The band's second in command, one Najmutdin, was taken prisoner. A large quantity of arms and ammunition was seized. Petr Ivanovich had the occasion to get a close-up look at those who tried to shoot down his helicopter. Ragged and stubbly-whiskered, with dull, resentful gaze.... It was immediately apparent that these people held nothing sacred.

The helicopter crews hauled their captured booty back to the airfield. Chindin gazed at the captured weapons and felt a rush of hatred toward these hired mercenaries of imperialism. Like feelings were experienced by Honored Military Pilot USSR officer Aleksandr Timofeyev, military pilots 1st class Capts Mikhail Pyatibratov, Valeriy Kozlov, Andrey Novikov, Yevgeniy Kuzmin, and Anatoliy Kivalkin, who also displayed conspicuous gallantry on these combat sorties.

These events are reflected in Maj P. Chindin's service record. In this officer's citation accompanying award of the Order of Lenin one reads: "...In the Kharb River gorge P. I. Chindin spotted a bandit force and, delivering fire on that force, caused 18 bandits to surrender. The following day he encountered another bandit force in the same area, placed fire on it, forced it to abandon its positions, and bottled it up until the arrival of an Afghan Army mainforce. The following day, guided by ground controllers, a pair of helicopters with him flying leader hit and destroyed a 150-man bandit force which had made its way across the border to the Sanglich Pass. On the following days he took part in destroying and capturing scattered dushman detachments. He was the only pilot in the element to land at the conflict

site, at an elevation of 3,800 meters and under bandit fire, to evacuate wounded."

...I met Major Chindin in the comfortable, well-lit office of the head of the command faculty at the Military Air Academy imeni Yu. A. Gagarin, where Petr Ivanovich enrolled last year. He is of medium stature, solidly built, of a markedly athletic appearance, calm and composed, reserved, but behind all this one senses considerable latent energy. A man of strong will and stick-to-itiveness, he appears ready for action.

We proceeded to chat, and his life and travail-filled military career opened up before me, page by page.

Petr Ivanovich was born in 1954 to a peasant family in the village of Malaya Serdoba, Penza Oblast. He began thinking about a career as a military pilot when they were visited by his cousins -- Viktor Afonin, a graduate of the Balashov Higher Military Aviation School for Pilots, and Viktor Karpushkin, who had graduated from the Syzran Higher Military Aviation School for Pilots. They related with enthusiasm about flying and about the joy one experiences upon taking off into the heavens. And the youth became ignited by a dream. Upon completing secondary school, he enrolled at the Syzran Higher Military Aviation School for Pilots imeni 60th Anniversary of the USSR.

After years of training he earned a pilot-engineer diploma and a commission as a lieutenant. The young officer was assigned to a helicopter regiment stationed in the southern part of the country.

P. Chindin's first job assignment was as senior pilot-navigator on an Mi-8 helicopter. Serious, conscientious, and hardworking, Petr Ivanovich did such a good job that exactly one year later he was promoted to helicopter commander. Difficult flights over mountain and featureless desert terrain rapidly strengthened his professional skills and toughened his character. He proved to be an able, growing and developing military pilot and a skilled mentor of his subordinates. Two years later he was made section commander. Soon he was sent on a tour of duty to give internationalist assistance to our friends the people of Afghanistan.

Flying in the troubled Afghan skies, Petr Ivanovich, extremely attached to his family, would wait impatiently for news from his wife Svetlana. And it gave him joy to read in her letters about their son Kirill, who was born in 1980. At that time Petr Ivanovich was flying above outriders of the Hindu Kush.

His last year before enrolling at the academy Chindin spent as helicopter squadron commander, devoting a great deal of energy to training and indoctrinating young airmen and training reliable combat pilots.

...The missions flown in the skies above Afghanistan will remain forever in Petr Ivanovich's heart and memory. For him and for his comrades in arms, these missions had become, as it were, a symbol of the true, indestructible friendship between the Soviet and Afghan peoples, a symbol of international brotherhood. Selfless performance of his military and internationalist duty became the defining essense of their work in Afghanistan. Party member Maj P.

Chindin is happy that he carried out his duty with honor, making his contribution to an important and noble cause -- defense of the just cause of the Afghan people.

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MILITARY HELICOPTER CREWS FIGHT CHERNOBYL DISASTER

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 8, Aug 86 (signed to press 3 Jul 86) pp 10-11

[Article, published under the heading "Heroes Among Us," by Maj A. Zhilin: "Lending a Helping Hand"]

> [Text] When disaster struck at the Chernobyl Nuclear Power Plant, people displayed self-control, courage, organization, and cohesiveness in a difficult situation. Military aviation personnel from the guards helicopter regiment under the command of Gds Col A. Serebryakov were among the first to join the effort to localize and neutralize the consequences of the disaster. They played perhaps a decisive role in averting the threatening danger.

I met Military Pilot 1st Class Guards Colonel Serebryakov at the Central Military Aviation Scientific Research Hospital, where he was undergoing a precautionary medical examination. It was a quiet, sunny day. There was a mischievous twinkle in Aleksandr Ivanovich's slightly squinting eyes. His soft, engaging smile somehow did not initially gibe with the picture I had imagined in connection with that highly difficult and, quite frankly, dangerous mission he had been performing, subjected to the enormous burden of physical, emotional, and psychological stress. Only after our conversation did it become clear what an enormous store of spiritual and moral fortitude this officer possesses.

...In the middle of the night the phone rang.

"Comrade guards colonel, we have just received orders from higher headquarters to ready an element of six helicopters to operate out of cramped landing sites," the unit duty officer reported.

The regimental commander ordered: "Send a bus immediately for the aircrews of Yakovlev, Bilogan, Nikolayev, Ryzhov, Bezverkhiy, Savostin, and Voytko. I am leading for the base."

Hanging up the phone, Aleksandr Ivanovich thought for a moment. What was the reason for such haste? Although he was given no more information, he as commanding officer had plenty to ponder.

"What happened?" his wife asked, not concealing her alarm, still not accustomed to phone calls in the middle of the night even after years of marriage.

"Just routine. I've got to go over to the unit and handle a couple of matters," smiled Aleksandr Ivanovich to calm her, and quickly proceeded to get dressed.

During the entire ride out to the airfield, which seemed unusually long, Serebryakov pondered the possible reasons for the emergency phone call. He asked himself for the thousandth time why district air forces headquarters had ordered heavy helicopters made ready? After all, it was no easy matter for the crews of these aircraft to work at night out of cramped landing sites, if only because they lacked spotlights. That meant they would have to ready an additional pair of Mi-8s, which carried everything needed for night operations. Judging by all indications there was a serious matter afoot.

In the meantime the jeep entered the base main gate and headed toward the airfield command post.

"Comrade commander, the helicopters are ready to go. The crews will be here any minute," the duty officer reported.

"Fine. Get two Mi-8s ready as well. I'll go up myself in one of them."

At the command post the regimental commander saw his deputy hunched over a map.

"Here is the situation, comrade commander," the officer immediately began. "The element is to proceed to this grid square.... Something has happened at the Chernobyl Nuclear Power Plant. Apparently they need our help. Departure whenever you say."

"Now I am beginning to get the picture," said Serebryakov and, after a short pause, took an aircraft plotter and added: "Let's plot the route."

The officers proceeded to plot the route. Preparation of the helicopters for departure was in full swing out on the ramp. Officers O. Gasayenko, A. Odinets, A. Rakityanskiy, O. Anisimov, and I. Telegin, and Warrant Officers N. Dodatko, A. Pashko, D. Ruban, and V. Gritsko bustled about their helicopters. Having arrived at the airfield, pilots and navigators officers V. Degtyarev, V. Kaufman, N. Koltsov, S. Solodkiy, V. Balakhonov, and others went to work.

It was after midnight when the departure order came. The weather was not good: there was low, heavy cloud cover, and it was so dark that the flashes from the rotating beacons reflected brightly back from the cloud bases. Thunderstorm activity was building up ahead en route.

"Everybody maintain maximum alertness," the wingmen heard the commanding officer's calm voice over the radio. "We'll swing west around the thunderstorm activity...."

Guards Colonel Serebryakov glanced at his watch: they would soon be at their destination.

The helicopters touched down precisely at their ETA. The high degree of skill and experience of these aircrews and the foresight of their commanding officer were in evidence at the very first phase of their mission.

At the destination the aircrews learned something about what had happened.

Early that morning Gds Col A. Serebryakov and Col B. Nesterov, deputy commander of air forces of the Kiev Military District, flew over to Chernobyl. When the officers arrived at the party city committee, representatives of party and soviet agencies and state commission members were already there. Experts had concluded that sand, special chemicals and lead had to be dumped onto the stricken reactor as quickly as possible, to prevent the escape of radioactivity. But how could this be accomplished? It could not be done from the ground. That meant there was only one way to accomplish it -- from the air.

After Col B. Nesterov gave Serebryakov a situation briefing, the regimental commander gathered together his helicopter crews. He always conferred with his men at difficult moments.

"We must give thought to how the mission can best be accomplished," Serebryakov addressed the aircrews.

"We shall discuss the entire problem right now and report what we have come up with, comrade commander," said the regimental deputy commander for aviation engineer service, Lt Col S. Yurko.

The search for ways to accomplish the critical mission began. Engineer and technician personnel suggested loading sandbags and securing them to the ordnance mounting pylons, and subsequently dropping them onto the reactor. It was a good idea, but how could they make full use of the helicopters' payload capacity?

Civilian workers approached Nesterov and Serebryakov.

"There are some iron buckets in the tool shop. Can they be adapted for the job?"

The buckets were large, for tower cranes. This was fine, but how could the helicopters be rigged to carry them?

"Here is how we'll do it," said Serebryakov. "I'll have them weld cables here and here. The two rear cables will be connected together."

While the technicians worked on adapting the crane buckets, Colonels Nesterov and Serebryakov headed out toward the helicopters. They were to make a reconnaissance flight.

Taking off, they took an aerial tour of the power station, assessing the general situation, then set down in the local stadium and took passengers on board -- state commission members, specialist personnel, and a film crew. The helicopter made a 360 degree banked turn around the reactor. There was plenty of work to go around. The cameramen endeavored to record the accident as fully and accurately as possible.

At this point we should particularly emphasize the fact that the Western press, pursuing a policy of zealous anti-Sovietism, reported throughout the world that a "catastrophically dangerous" accident had taken place and disseminated a totally phony story about "immense" casualties at Chernobyl. This film, taken on the first flight over the reactor, was immediately shown on Soviet television and exposed all the lies being spread by bourgeois propaganda.

The second reconnaissance flight was more complicated. Serebryakov had to determine possible configuration and parameters of runs over the reactor. The pilot flew over the reactor building. From a height of 300 meters the reactor crator looked like a huge, hot frying pan glowing around the edges. They descended to 150-200 meters. This was unquestionably risky, for a wrong control movement or ill-considered change in engine operating conditions could lead to undesirable consequences. But the commanding officer flew with great skill.

After returning, Guards Colonel Serebryakov reported to the officials in charge: "I consider it advisable to operate at a height of 200 meters, at an airspeed of 50. It would be dangerous to drop any lower: the hot air could cause the engines to stall."

The commission members approved his decision.

"Comrade commander, may I comment on delivering payload?" Lt Col S. Yurko addressed Aleksandr Ivanovich. "The buckets are ready. But I do not feel that this is the best solution. Each bucket weighs more than 100 kilograms. I suggest that parachutes be used on the other helicopters, using the 'apron' principle."

The regimental engineer explained: "Two free ends of the parachute would be secured to the mounting racks, while the other two would be attached to the weapons station hardpoint. Push the release button at the proper time, and it will open up like an apron, releasing the sandbags."

"Do it!" the regimental commander approved.

Another problem arose during preparations to release payload: how should they approach the target in order to achieve maximum accuracy of release?

"Here is what we can do," Colonel Nesterov suggested. "I shall assist by radio."

...The reactor was clearly visible from his position. Colonel Nesterov selected appropriate reference points and contacted the regimental commander by radio: "I have visual observation of the target. Approach heading... reference points...."

The helicopter approached the center of the crater at minimum airspeed. Navigator Maj S. Nikitin carefully aimed and released the sandbags from the pylons. He scored a direct hit. Then the commanding officer dropped the main payload at the controller's command. The sacks fell right into the middle of the reactor. Flight technician [crew chief] Senior Warrant Officer Vyshkovskiy dropped packaged materials out of the cargo cabin.

A helicopter flown by Lt Col Yu. Yakovlev followed the commanding officer's helicopter to the initiation point of the bombing run. Navigator Sr Lt V. Balakhonov sighted the helicopter on the target. The information received from Colonel Nesterov confirmed the navigator's flawless precision. Bombs away! Direct hit.

As the loading site the helicopters came into the solicitous hands of the ground crews. Without losing a single minute, officers S. Yurko, A. Volkov, N. Gavshin, Yu. Kolychev, V. Streletskiy, and A. Khodarenok, and warrant officers V. Ryumshin, A. Khleborodov, M. Katyuk, and N. Ganzhuk quickly mounted the payload, at the same time inspecting the aircraft. By the end of the first day each of the technicians and mechanics had relayed more than a ton of sand. The work load increased when Mi-6s and later Mi-26s as well joined the operation, capable of carrying more than 4 tons of payload. An almost continuous stream of sandbags and lead plummeted onto the reactor.

Aircrews competed with one another, each endeavoring to fly the greatest number of sorties and to hit the target with greater accuracy. Nobody specifically worked on organizing such competition. It resulted from the acute need to accomplish the task faster and better. The crews of Lt Cols Yu. Yakovlev, S. Bilogan and V. Nikolayev, Maj N. Ryzhov, Capts V. Bezverkhiy, S. Savostin, and K. Voytko set about the job with enthusiasm, in spite of all the difficulties involved.

Many of the Air Force personnel who helped combat the disaster acquired combat experience in the skies of Afghanistan and hold coveted government decorations. In particular, Gds Lt Col A. Serebryakov was awarded the Order of the Red Banner. Those missions taught the helicopter crews a great deal and gave them mental toughness, for they frequently were compelled to fly under dushman [Afghan rebel] machinegun fire. The ever-lurking danger forced them to be alert at all times and demanded courage, self-sacrifice and at the same time wary cautiousness and sober calculation.

...By the end of the first day of helicopter flights, the situation at Reactor No 4 had significantly improved. The flames had been beaten back, and the radiation level had dropped.

But this was only the first step toward victory. As he was resting after 17 very difficult sorties, Serebryakov recalled a mission in Afghanistan which had been equally difficult. Helicopter aircrews had been assigned a mission to deliver a subunit of Afghan soldiers to Black Mountain. It had been given this sinister name due to its rugged inaccessibility. Many defenders of the Afghan revolution had fallen from dushman bullets at the foot of this mountain. Aleksandr Ivanovich knew that on the mountain peak there was only one tiny site more or less suitable for putting down. He also knew that it was vulnerable to hostile fire from all sides. But there was no other choice.

When the six helicopters reached the destination area, fire in the mountains abated. The dushman were waiting for the Soviet helicopters to land, upon which they would pour intensive fire onto them. Officer A. Tyrykin's crew was to be the first to land. Circling once, twice, he suddenly reported: "The engines are responding poorly; my ship is overloaded."

Serebryakov ordered him to return to the base. Captain Kurilov commenced a landing approach. When the helicopter came to a hover above the landing site, a machinegun burst smashed the windshield. A round struck the courageous pilot in the heart. But the helicopter did not plunge groundward. The copilot safely landed the craft and unloaded the troopers. Serebryakov came in next, provided cover by his comrades. A bandit-fired round pierced his headset one centimeter to the left of his temple. After the troopers had dismounted, the pilot took off and commenced a banked turn at a height of 100 meters above the mountaintop, seeking to draw dushman fire; spotted weapon positions were immediately taken out by the other helicopters. Of course this was taking a big chance, but party member Serebryakov took such a chance in order to save people's lives: while the bandits were pouring fire at his helicopter, other crews picked up wounded.

Here at Chernobyl Aleksandr Ivanovich and his men were risking their own lives for the sake of the safety of hundreds and thousands of Soviet citizens. And perhaps it was even more difficult on this "field of battle," for they were faced with a dangerous and insidious foe -- radiation, which at first gives no hint of its presence but does its damage little by little. It is evidently for this reason that Serebryakov recalled the combat incident.

Thinking over these events, the regimental commander was aware of a special feeling toward his men with whom he had flown to Chernobyl: a feeling of confidence in the men and a profound respect for them because the most important concept for them was "our" and "the people's," with "my" and "my own personal" back in second place. He knew that if necessary every one of them was willing to give his life for the welfare of our country. These ordinary Soviet lads have been brought up to be unable to be indifferent toward other people's troubles, wherever they might occur.

...The few hours of rest went by swiftly. The aerial bucket brigade resumed at dawn on the following day. Once again the commanding officer was the first up, followed by his men. Once again Colonel Nesterov, microphone in hand, guided them from the ground. Boris Aleksandrovich refused to leave his post even to eat -- meals were brought right to his duty post.

This process continued virtually without interruption. The reactor was "sealed" tight on the third day. But the flights did not cease. Soon other aircrews arrived and joined the effort. But the first still remained first. It is they who accomplished the main task. And although it is not possible to list all their names, I am confident that nobody will be forgotten. The fine deeds accomplished by the guards helicopter crews will receive due praise.

After a brief rest and a precautionary medical examination, all airmen proceeded with their scheduled flight activities.

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PERFORMING COMPUTATIONS ON NONPROGRAMMABLE ELECTRONIC CALCULATORS

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 8, Aug 86 (signed to press 3 Jul 86) pp 20-21

[Article, published under the heading "The Pilot and the Computer," by Cols A. Andreyev and V. Rubin: "Calculations on Nonprogrammable Microcalculators"; second article of a series -- see No 7, 1986]

[Text] Engineering microcalculators (MK) have considerable capabilities for solving various combat training problems. We shall examine these capabilities using as an example the Elektronika MK-41 non-battery-operated electronic desktop calculator, which features algebraic logic, hierarchy of operations, and simple parentheses syntax. It has 36 keys, each of which can perform only that operation which is marked on it (Figure 1).

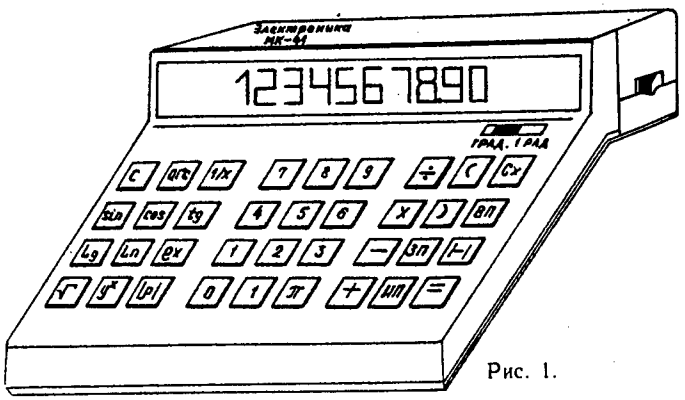

Рис. 1.

Figure 1.

When the calculator is switched on, the display automatically is set to a mode where computation results are displayed in the form of a number with two digits to the right of the decimal point.

The number keys 0 to 9, the decimal point key ",", +/- toggle and exponent key "-", and exponent entry key "VP" are used to enter numbers into the MK-41. During entry of numbers, information is stored in operation register X, the contents of which are presented in conventional decimal form on the 14-position display. The first position is used to display the minus sign. A plus sign is not displayed. The next 10 positions are used to display 10 digits (mantissa) and decimal point. The 12th position is used to display a minus sign for a negative exponent, while the 13th and 14th positions are for displaying two exponent digits. The key Cx is used to cancel an incorrectly entered number.

The MK-41 can also switch display mode to conventional decimal number display. To switch to this mode press keys arc, ",", n, where n is a number key 0...9, which specifies the number of digits to the right of the decimal point. In addition, the MK provides automatic normalization of numbers and number of digit positions the mantissas of which do not exceed 9. To set this mode, press the arc and n keys, where n is a number key which determines the number of digits to the right of the decimal point in a normalized number. For example, the number 123.4567893 is entered into the MK. If a five-digit mantissa is specified, after pressing the arc and 5 keys, the number 1.23456 02 will be displayed. With a nine-digit mantissa, the MK will display 1.234567893 02.

We shall examine operations on the MK-41 first with single-number operations and subsequently with two-number operations.

The MK-41 can perform the following single-number operations: 1/X, square root of X, lnX, lgX, e to the x power, sinX, cosX, tgX, arcsinX, arccosX, arctgX. First enter the number (argument), and then press the appropriate operation (function) key. Table 1 contains examples of such operations.

Table 1.

Таблица 1

1 Содержание математических действий	2 Вычисление значения e^3	2 Вычисление значения lg 5	Определить sin 0,8 с 3 точностью до 6-го разряда после запятой	Определить tg 35° 3 с точностью до 6-го разряда после запятой
4 Программа	[3][e^x]	[5][lg]	[arc][.][6] рад 6 [.][8][sin]	[arc][.][6] град 7 [3][5][tg]
5 Показания индикатора	20.09	0.70	0.717356	0.700208

Key: 1. Content of mathematical operations; 2. Calculation of value; 3. Determine ... with an accuracy to six digits; 4. Program; 5. Display; 6. rad; 7. Degrees

To perform two-number operations on the MK-41, which include the arithmetic operations of addition, subtraction, multiplication, division, and raising to a power, use the +, -, X, "divide", and Y to the x power keys, and the X and Y stack registers. We shall examine two-number operations with a simple example: 5+3=8. Pressing the 5 key, we enter the first operand into the X register. The following operator signals completion of number entry -- in this case +. After entering the second operand -- 3 -- into the X register, the number 5 is transferred from the X register into the Y register. If we then press the result key -- "=" or ")", the number 8 will be displayed, that is, the number 5 in the Y register is added together in the arithmetic and logic unit (ALU) with the contents of the X register -- the number 3, while the result -- the number 8 -- is stored in the X register and displayed.

Thus the old contents of the Y register are erased following any arithmetic operation. If we now key in a new operation and number, the result of the previous operation will be transferred from the X to the Y register, and the operation will be performed with the new number and old result. Such calculations are called chain calculations.

In addition to arithmetic operations, two-number operations include the following: raising a number to a power X(Y to the x power), and a specialized functional operation which computes a square root from the sum of the squares of two numbers (X=square root of a squared + b squared). In the MK-41 this operation is designated by the symbol .

To raise a number to a power, first enter the base (number Y), and then, after entering the operator for raising to a power, Y-x, enter the exponent. For example, in calculating the value of 15 to the power of 5, the key sequence is as follows: 1, 5, Y-x, 5, =. The following number will be displayed: 759375.00.

When performing calculations with the operator, first enter the first operand and then, after pressing function operator key , enter the second operand. For example, to calculate the value of the square root of 3 squared + 4 squared, the key sequence is as follows: 3, , 4, =. The following number will be displayed: 5.00.

The MK-41 performs calculations with automatic consideration of priority of operations. Raising to a power and extracting a square root are the highest in rank, followed by multiplication and division, followed by addition and subtraction. Thus in order to perform operations on two numbers one need only press any operation key of the same or lower rank. We shall illustrate this with an example of mixed calculations: 2 + 3 x 6 = 20. If we sequentially press keys 2, +, 3, X, 6, =, the correct result is displayed -- 20.00. That is, due to the input language of the MK-41, which takes into consideration priority of operations on two numbers, the sequence of performing the latter will differ from the order of keyboard entry. We can see this by examining stack operation. After we press keys 2, +, 3, the Y register will contain the number 2, while the number 3 will be stored in the X register and displayed. Entering the multiplication operator and the number 6 will transfer the number 2 into the Z register, the number 3 into the Y register, while the number 6 will be stored in the X register. After pressing the "=" key it will be

multiplied in the AIU with the contents of the Y register — the number 3, the obtained result will be stored in the X register, and subsequently added together with the number 2, which "dropped" from the Z register into the Y register. The final results will be displayed — the number 20.00.

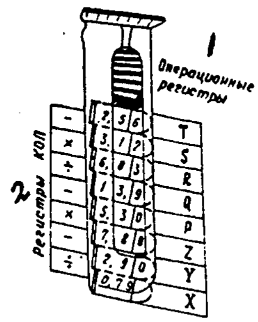

Рис. 2.

Figure 2.

Key: 1. Operation registers; 2. Operation code registers

In the above examples three memory stack registers (X, Y, Z) were used. There are a total of eight in the MK-41 stack. The stack capacity is sufficient to store up to eight numbers and up to seven operation codes. In case of a stack overflow, the stack overflow warning appears on the display (.........).

The MK-41 also has parenthesis operators in order to change the natural sequence of performing operations by precedence. These operators make it possible to use all stack registers. For example, we wish to determine the function:

$$y = a - b \frac{c}{d - e(f - g/h)},$$

where a=2.56; b=3.12; c=6.03; d=13.9; e=5.3; f=7.8; g=2.9; h=0.79.

Employing parentheses notation, which indicates the sequence of performance of operations, and substituting constants, our calculation assumes the following form: y = 2.56 — (3.12 x (6.03 : (13.9 - (5.3 x (7.8 - (2.9 : (0.79))))))).

The computation program in the MK-41's input language will be as follows:

[2] [.] [5] [6] [−] [(] [3] [.] [1] [2] [×] [(] [6] [.] [0] [3] [÷] [(]

[1] [3] [.] [9] [−] [(] [5] [.] [3] [×] [(] [7] [.] [8] [−] [(] [2] [.]

[9] [÷] [0] [.] [7] [9] [=].

Pressing the keys in sequence, we enter the program into the MK's operation stack, but we shall not yet enter the final operator, "=" (result).

Let us analyze the process of filling the stack registers with numeric information; as a physical model we shall picture a pistol clip, the "cartridges" in which will be the operands we enter (Figure 2).

After pressing keys 2, ",", 5, 6, the first number 2.56 was stored in stack register X and displayed. The next-pressed two-number operation key "-" indicates completion of number entry. In place of a second operand, however, the opening parenthesis operator was stored in the stack, which causes the operation code "subtraction" to be stored in the COP register (Figure 2).

When the second operand, 3.12, is entered into the X register, the number 2.56 is transferred into the Y register, that is, the "second cartridge" (the number 3.12) pushes the first cartridge (the number 2.56) into second position in the clip, etc.

Following entry of the final (eighth) number, 0.79, the MK is ready to solve function y, since its eight operation registers will contain eight numbers, which corresponds to a "clip loaded with eight cartridges," while the seven COP registers will be filled with the codes of seven operations (Figure 2). The correctness of clip loading -- storing of numbers in the stack registers, can be checked by sequentially pressing the X register clearing key "Cx". The numbers 2.90, 7.80, 5.30... 2.56 will be sequentially displayed.

We shall again enter the y function calculation program. Now we shall let it complete by pressing the "=" or ")" key. In approximately 2 seconds the MK, like an "8-round burst," will display the result 4.92.

In addition to the stack memory, the MK-41 also contains three addressable accumulator registers. They store input data and intermediate calculation results. Numbers are stored in these registers by pressing the "ZP" key and one of the number keys 1, 2, or 3, which specifies the memory register number. To call a number from memory, press the "IP" key and the number key which specifies the memory register number.

When a number is called from an addressable register, it is transferred to the X register. It is of no significance for calculations whether numbers are entered from the keyboard or are transferred from addressable memory registers. For example, let us enter the numbers 6 and 8 respectively into memory registers 2 and 3 and multiply them. The calculation program will be as follows: 6, ZP, 2, 8, ZP, 3, IP, 2, X, IP, 3, =. The result, 48.00, will be displayed. Registers 2 and 3 were used in this example. There is a certain peculiarity involved in using register 1, which is that a number entered into register 1 can be used in performing operations on two numbers without first calling it. Table 2 contains an example (see following page for table).

As we see, number 2 is one ofthe operands in all four expressions, and therefore the 1 register (column 2) is used to store it. This subsequently enables us to solve the following equations (columns 3, 4, 5) without accessing the memory register, using only the result key "=".

We shall examine the specific features of performing various operations on the MK-41 with a standard example.

Table 2.

Таблица 2

1 Содержание математических действий	$2+5$	4×2	$6:2$	7^2
2 Программа	[2][ЗП][1][+][5] [=]	[4][×][=]	[6][÷][=]	[7][Y^x][=]
3 Показания индикатора	7.00	8.00	3.00	49.00

Key: 1. Contents of mathematical operations; 2. Program; 3. Display

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Example. Determine for three load factor values -- 2.5, 4.5, and 6.5 -- an aircraft's turn radius at airspeeds ranging from V1=500 km/h to V10=950 km/h, at 50 km/h intervals.

Before solving the problem on the MK we shall determine the most optimal calculation scheme. For this, we shall represent the entire turn radius formula R=V squared over g times the square root of nyi squared - 1 in a convenient form for the MK: R=V squared over Ci, where Ci = K time the square root of nyi squared - 1; K = 3.6 squared x 9.81; nyi = 2.5; 4.5; 6.5; i = 1, 2, 3.

The calculation scheme contains the following stages: calculating quantity K and storing the result in one of the addressable memory registers (register 3); calculating C1, C2, and C3, extracting value K from register 3 and storing the obtained results in registers 1, 2, and 3 respectively.

Then for each airspeed (500, 550... 950 km/h -- we determine the turn radius with the formula: R=V squared over Ci.

This scheme determines the keying sequence:

1. Determination of K and storing the result in addressable register 3:

[3][,][6][Y^x][2][×][9][,][8][1][=]; [ЗП][3]

Intermediate result: 127.14.

2. Determination of C1 and storing the result in addressable register 1:

[(][2][,][5][Y^x][2][−][1][)][√][×][ИП][3][=]

[ЗП][1].

Intermediate result: 291.31.

3. Determination of C2 and storing the result in addressable register 2:

[(][4][.][5][Yˣ][2][−][1][)][√][×][ИП][3][=]:

[3П][2].

Intermediate result: 557.81.

4. Determination of C3 and storing the result in addressable register 3:

[(][6][.][5][Yˣ][2][−][1][)][√][×][ИП][3][=]:

[3П][3].

Intermediate result: 816.57.

5. Determination of aircraft turn radius at V=500 km/h.

Results of calculations:

[5][0][0][Yˣ][2][÷][=] $R_1 = 858.20$ м when при $n_{y1} = 2.5$;

[5][0][0][Yˣ][2][÷][ИП][2][=] $R_2 = 448.18$ м when при $n_{y2} = 4.5$;

[5][0][0][Yˣ][2][÷][ИП][3][=] $R_3 = 306.16$ м when при $n_{y3} = 6.5$.

Определение радиуса разворота самолета при V = 950 км/ч.

Determination of aircraft turn radius at V=950 km/h.

. . . . . .

. . . . . .

Results of calculations:

Результаты вычислений:

[9][5][0][Yˣ][2][÷][=] $R_{28} = 3098.09$ м при $n_{y1} = 2.5$; when

[9][5][0][Yˣ][2][÷][ИП][2][=] $R_{29} = 1617.92$ м при $n_{y2} = 4.5$; when

[9][5][0][Yˣ][2][÷][ИП][3][=] $R_{30} = 1105.25$ м при $n_{y3} = 6.5$. when

(To be continued)

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FORESEEING AND PREVENTING CAUSES OF AIR MISHAPS

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 8, Aug 86 (signed to press 3 Jul 86) pp 22-23

[Article, published under the heading "For a High Degree of Flying Efficiency and Safety," by Maj V. Dolgishev: "A Surprise Which Was Expected"]

[Text] The fighter came in on final a bit hot. Just as its wheels touched, it skipped back into the air.

"Hold the stick!" the flight operations officer ordered Sr Lt A. Molchanov. "Now bring it down...."

Prompt intervention by the tower ensured a mishap-free landing.

A question arises, however: why is it that a pilot who was considered adequately proficient proceeded to fly an approach which violated rules contained in the documents governing flight operations? A. Molchanov said in self-justification at the subsequent performance critique: "I made a mistake. Everybody makes mistakes."

"Incorrect distribution of attention during landing".... This statement appeared in the near-mishap log. This was followed by a list of preventive measures: additional study of theory, simulator work, check ride....

This disturbing incident was discussed with flight personnel in order to prevent it from happening again. Full assurance was lacking, however. And indeed, another mishap-threatening situation was not long in coming. Soon another pilot in that same subunit made a bad landing. And once again there ensued a hasty critique session and a to-the-point discussion. The guilty party found rationalizing arguments.... Once again they entered in the log: "Incorrect distribution of attention" and "Poor landing procedures."

An Air Forces flight safety service inspector took part in the critique, explaining to the men that incorrect distribution of attention is not a cause but rather a consequence of a mistake. Poor landing procedures may involve inadequate training, excessive emotional stress, lack of attention, lack of discipline, and careless flying. In order to devise effective preventive

measures, it is necessary to determine the actual cause, for one should treat not the symptoms but the disease.

They proceeded to analyze the problem and revealed flaws in the flying skills of other pilots and weak links in flight preparation methods.

Of course these incidents are not unusual. But I believe they should give pause for serious thought.

"I made a mistake. Everybody makes mistakes...." This shopworn expression appears to accept in advance both the pilot's culpability and the inevitability of a mistake, which is merely awaiting the opportunity to get past the close scrutiny of those who perform the functions of multistage inspection and verification in military aviation.

Is it possible reliably to predict and prevent errors? Let us not be hasty with a reply to this question, for there are all kinds of mistakes. There are random errors caused by an unfavorable confluence of many circumstances which are not interlinked. It is fairly difficult to establish the causes. But the overwhelming majority of mistakes are classified as ones which occur in the normal course of things. They are characterized by an interlinkage of basic causative factors. This means that they can be predicted, revealed, and that appropriate preventive measures can be taken, rather than dumping the entire blame on the pilot. Although the pilot is always the end element in an air mishap or mishap-threatening situation, sometimes he can become the "guilty party" while performing faultlessly in an emergency situation (of course within the limits of his psychophysiological capabilities).

Let us say, for example, that an error was caused by deficiencies in organization of flight operations or unsatisfactory ergonomic support (deficiencies of information display, airplane or helicopter cockpit layout). This problem, connected in modern aviation medicine with the term human factor as characterizing reliability and efficiency of the "pilot-aircraft" system, is a special and highly complex one.

Let us examine the reasons for faulty actions caused chiefly by the personal factor -- the pilot's individual features which are adverse for flight activities: insufficient level of job proficiency and psychological stability, and lack of discipline.

Modern scientific data and the experience of vanguard Air Force collectives which have operated for an extended time without air mishaps convincingly attest to the fact that mistakes can be predicted, and consequently they can be prevented. But this requires a thorough analysis to reveal their inner causes, utilizing methods of psychophysiological analysis.

Take the experience of one of our vanguard units. They do not simply wait for the unexpected to happen, but conduct aggressive, purposeful preventive efforts.

...The crew of a heavy combat jet was doing pattern work. Everything was proceeding normally. But on final approach the aircraft commander, Lt Col A.

Fedorov, failing to consider specific weather factors (no wind), was slow in throttling back and rounded out high. The aircraft made a hard landing, the load factor in excess of the maximum allowable for that aircraft. And once again incorrect attention distribution by the pilot during landing was stated at first as the reason for the faulty actions. A psychophysiological examination of this officer on the KTS-6 simulator, however, utilizing a Fiziolog-M unit, indicated that he possessed sufficient reserve potential for switching attention. The final conclusion: the mistake involved incorrectly-learned landing procedures.

Here is another incident. During a tactical air exercise Capt I. Pisarenko, flying in instrument weather, was to fly a range bombing run with bombsight. Upon reaching the range, the pilot commenced visual search prematurely, and therefore came up 2 kilometers left of his target, which prevented him from accomplishing the mission. While on final approach back at his departure airfield, Captain Pisarenko, trying to avoid undershooting the runway (he was landing into a 10-15 m/s headwind), delayed throttling back and flared early, which resulted in overshooting the landing zone by 50 meters. It is true that the aircraft remained on the runway and that no damage occurred.

Following a thorough analysis, emotional stress due to the failure at the range was named as the principal reason for the pilot's faulty actions. It led to diminished quality of flying skills in landing the aircraft. Contributing factors included landing at an unfamiliar airfield, as well as weather (strong headwinds). The immediate cause of the error was delay in throttling down upon crossing the runway threshold.

A thorough analysis of errors indicated that although externally similar, they were due to different and by no means chance causes. In the first example the cause was incorrectly-learned landing procedure, and in the second instance it was the pilot's heightened emotional stress. Consequently different preventive measures were also applied. Additional simulator sessions and a check ride were scheduled for Lt Col A. Fedorov, while the psychological essence of what had occurred was explained to Capt I. Pisarenko, and recommendations were given to him on improving his moral-psychological conditioning, and distracting elements began to be introduced during simulator sessions and check rides.

One can judge the effectiveness of these measures by the fact that such errors were not repeated in the unit.

Practical experience indicates that the actual causes must also be sought even when at first glance they are in full evidence. Take the following. Following an intercept, Military Pilot 1st Class Maj A. Tishchenko came too close to the target aircraft. Then, flaunting his "skill" to the young pilot flying the target aircraft, he executed a turn, intending to pass above the target aircraft. A serious in-flight mishap was avoided by pure chance. The reason for the occurrence was personal lack of discipline on the part of Major Tishchenko. By all indications this officer did not have the habit of studying documents governing mishap-free flight operations, manuals and regulations, and was not in the habit of adhering to them. If this was the case, this gross violation of regulations did not simply happen -- things

built up to it. This is why, while not exculpating the pilot, the higher command authorities concluded that there was a lack of orderly procedure in the subunit.

"A mistake was made. Everybody makes mistakes...." A statement like this, to cover one's lack of action, constitutes a lip-service approach to analysis and prevention of mistakes. A "theoretical foundation" is sometimes constructed under such a position: the claim is made that one cannot avoid unforeseen situations and chance occurrences in the air. And yet as a rule surprises and sudden, unexpected occurrences are not involved in air mishaps. Another factor is involved: pilot error, loss of skill following a protracted period without flying, excessive emotional stress, and overrating of one's abilities. But even these factors should not be accepted as an exhaustive explanation. In every erroneous action it is important to find the job-related and psychological reasons for a given mistake. Here too one can discover a patterned mechanism in what at first seemed to be a chance occurrence. We encounter those same aggravating elements of excessive haste, carelessness, lack of attention, negligence, overrating of one's ability, the disinclination and sometimes inability to operate independently, and an irresponsible attitude toward simulator work....

A reliable shield can be set up against violations of flying discipline. This is persuasively attested to by the experience of vanguard outfits. Wherever flight, detachment, and squadron commanders approach analysis of errors and mistakes in an innovative manner and perform analysis not in a lip-service way but utilize new methods and enlist the services of various specialist personnel, they are able to foresee possible unexpected occurrences and prevent them by specifying effective preventive measures.

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HELICOPTER REGIMENT AVIONICS MAINTENANCE

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 8, Aug 86 (signed to press 3 Jul 86) p 27

[Article, published under the heading "From Experience in Mishap-Free Flight Operations," by Maj Ye. Turkin: "Guarantee of Reliability"]

[Text] It was early in the morning. Aviation regiment technical maintenance unit specialist personnel were hard at work. Adhering rigidly to prescribed servicing procedures, Capt A. Zhidkov's men were carefully and thoroughly testing to make sure that avionics were in good working order. This group is one of the best in the technical maintenance unit. Its specialist personnel have not been guilty of a single instance of poor-quality or incomplete preparation of helicopters. They perform with a strong feeling of responsibility each and every operation prescribed by the uniform servicing procedures and discover the slightest malfunctions in prompt and timely manner. Capt A. Zhidkov of course deserves a good deal of the credit for this.

Upon graduation from military aviation technical school, he was assigned to the unit as a servicing and maintenance group technician. It did not take him long to prove his ability. This officer was made group chief. His organizer abilities genuinely blossomed in this new position. For example, the maintenance procedures checklists in the technical maintenance unit were revised at Zhidkov's initiative, resulting in improved quality of servicing and maintenance. This officer is hardworking, a man of integrity, extremely knowledgeable, and conducts training and indoctrination in a skilled manner. He enjoys the absolute respect of his men.

The group's specialist personnel always perform servicing and maintenance with excellent quality, with precision and on schedule, and are able to determine on the basis of the slightest symptoms the probability of malfunction. Recently an error was detected in the radar altimeter readings on one of the helicopters, which could have led to undesirable consequences. Here is how the problem was discovered.

Senior avionics servicing specialist WO A. Frolov was testing a radio compass. All readings fell within the normal range. But the warrant officer spotted a drop of liquid at a hard-to-get-to location for inspection. Although it was

very small, this experienced specialist felt it was a cause for concern. He removed the cover from the power supply and saw that the electrolytic capacitors had begun to leak, apparently from the effect of high temperatures. The problem was promptly corrected, and the helicopter was signed off for its post-maintenance check flight without delay. Thanks to the alertness and vigilance of this aviation specialist, a potential precondition for an air mishap was corrected in a prompt and timely manner.

One can cite many examples of conscientious performance of duties by military personnel. The overwhelming majority of aviation engineer service specialist personnel in the unit conscientiously carry out their duty. They are genuine masters of the helicopters they maintain -- knowledgeable, hardworking, and alert. Even the slightest equipment performance abnormality does not escape their vigilant eye. The men are able promptly to determine a malfunction and to do everything necessary to correct it promptly and expeditiously. Reliability of equipment operation is guaranteed by a high degree of personal responsiblity, professional skill, and profound knowledge.

Not all Air Force personnel, however, particularly young personnel, possess sufficient experience and know-how, and this at times adversely affects the quality of preparation of aircraft for flight operations. I recall an incident which involved a young avionics servicing specialist. Preparation of the helicopter required checking the aircraft radio. But the young man was unable to perform the job in a quality manner. When they looked into the matter it was ascertained that he was inadequately prepared for his job. As long as he was assigned simple tasks, his knowledge and skills were sufficient, but as soon as he was given a more difficult job, he was unable to handle it....

This incident indicates that each and every aircraft maintenance specialist must be fully aware of his personal responsibility for an assigned task and must be constantly concerned with advancing his job knowledge. And his group chief, other aviation engineer service persons in authority and, of course, his more experienced comrades are obligated to help him with this. In the instance under discussion, however, they displayed indifference. While aware that the young maintenance specialist had slacked off on increasing his job proficiency, they did nothing to ensure that he constantly added to his knowledge, honed his skills, and adhered to equipment servicing procedures. And yet Air Force regulations are very strict. Each specialist bears personal responsibility for his job. The cost of a mistake or error by maintenance specialist personnel is sometimes too great: an aircrew is put into a life-threatening situation. This is the reason for such stringent demands on the professional, moral and ethical qualities of persons involved in servicing, maintenance and operation of aircraft.

The experience of vanguard outfits in avionics maintenance convincingly attests to the fact that most aircraft equipment malfunctions can be avoided, for most frequently they happen due to failure of parts subjected to gradual wear: cables, connectors, relay contacts, pushbuttons and knobs, wires, and antenna leads. These malfunctions fall within the gradual failure category. Consequently they can be prevented. And this requires acting before a malfunction occurs while airborne. Carefully and thoroughly testing and

checking avionics gear during performance of routine servicing and maintenance and between maintenance, it is essential to discover problem components and replace them in a prompt and timely manner.

This is how group technician Lt A. Kovalev proceeds, for example. Upon graduating from aviation technical school, the young specialist was called up to active duty in the Air Forces from reserve status. After a probationary period he was placed on regular duty status and now works unsupervised. This vanguard Air Force officer is distinguished by an exceptionally hardworking nature and a feeling of personal responsiblity for the assigned task. He is aware that the outcome and safety of a flight frequently depends on the quality of aircraft equipment preventive maintenance. There has not been a single instance of avionics failure in the air through the fault of Lieutenant Kovalev or his men. On the contrary, in spite of his relatively short time on the job, this officer has prevented several equipment malfunctions.

Once while performing preparatory procedures for flight operations, as he was checking radio compasses, Lieutenant Kovalev noted that the ADF on one of the helicopters was giving fluctuating readings. Reporting this to his superiors and receiving authorization to perform maintenance, he proceeded to check the entire circuitry in sequence and located the problem: a break in a delay line. Thus thanks to his diligence and alertness, this officer averted an air-mishap threatening situation.

Group chief Sr Lt V. Dolgikh, who has proven to be a skilled mentor of young officers, developed these qualities in Lieutenant Kovalev. In the three years he has held this position, party member Dolgikh has broken in several new service school graduates and officers called up to active duty from the reserves. And he is an outstanding specialist. He always endeavors to find for himself the cause of a malfunction and asks for assistance only in extreme instances.

The group has excellent equipment and facilities. This group was named the regiment's socialist competition winner based on training period performance.

...Summer combat training is in full swing. Air Forces personnel are working hard on mastering combat equipment both in the air and on the ground. The quality and effectiveness of combat training and flight safety depend in large measure on the job done by aviation engineer service specialist personnel. The main thing is to ensure that each man does his job conscientiously and with full effort.

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MAINTAINING PILOT FITNESS WITH PHYSICAL TRAINING

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 8, Aug 86 (signed to press 3 Jul 86) pp 28-29

[Article, published under the heading "Physical Training and Athletics," by Maj V. Tovt, officer graduate student at the Military Physical Culture Institute: "In the Interests of Flying SKill"]

[Text] It sometimes happens that young pilots, due to insufficiently developed emotional stability and lack of physical preparedness for the adverse factors encountered in flying, are unable to master a new aircraft within the allocated timetable. Correction of such deficiencies or, stated more precisely, improving the psychophysiological stability of flight personnel, is one of the main jobs of physical training. It has in its arsenal a great many devices which help effectively develop aviator job-related qualities. As practical experience indicates, however, some commanders, and pilots as well, sometimes fail adequately to appreciate its capabilities. This is persuasively attested by far from uncommon instances where time allocated for physical training activities is used for other purposes. This results in disruption of the unity and coordination of instructional and learning effects within the integral system of combat training of military aviators.

It has been ascertained in the process of investigation of this problem that the main reason for deficiencies in organizing physical training activities is a shortage of time, caused primarily by the increased volume of training in theory. As a rule not more than 2-3 percent is available of the 6.2 percent of training time allocated to flight personnel for maintaining good health and improving physical and psychological qualities.

The problem of time is becoming increasingly acute in present-day conditions. I am of the opinion, however, that it is wrong to resolve this problem solely by concentrating efforts on the most important aspects of combat training activities at the expense of other subject ares, in particular to the detriment of physical training. I feel that the solution lies in more precisely organizing the training process, correctly distributing manpower and resources, and maintaining firm follow-through. The main task consists in teaching military personnel to carry out training assignments in a prompt manner and to expend economically every minute of time on duty. It is also

necessary to endeavor to increase the effectiveness of every training class and to achieve unity and coordination among all forms of physical training.

It is no secret that many training classes in the units and subunits are not conducted at an adequate methodological level. Sometimes their content boils down to athletic games. Unquestionably athletic games are an important training means. Constant employment of a small number of physical exercises, however, adapts the organism to these exercises and diminishes the effectiveness of physical exercise sessions.

In order to make physical training really help the combat pilot, it is essential that every volunteer physical training instructor and all pilots be familiar with the specific features of its organization and have the ability to determine the main points in development of important flying qualities as well as the ability to select means of improving them. Table 1 contains a list of the principal flying qualities and suggested physical exercises which can be used specifically to develop any of these (see following page for table).

It is essential to remember that physical improvement is a complex process. The results of physical training are not always proportional to expended effort, while interest in physical training classes is closely linked to indications of improved fitness. If one gets the feeling that physical exercise is producing no effects, it is recommended that the causes be analyzed and ways to correct them be devised with the aid of Table 2 (see page 46 for table).

The experience of the Air Forces units in which Majs V. Narozhnyy, G. Shaykhutdinov, and A. Stasyuk are serving as physical training officers convinces us that even in the most difficult situation, in conditions of a severe shortage of training time, one can efficiently utilize physical exercises to prepare aircrews for flight activities. This is fostered in large measure by the physical training officers themselves, who display maximum resourcefulness and creative inventiveness in organizing training activities for flight personnel. They have established close contacts with local municipal sports organizations, in the pools and gymnasiums of which regular workouts and competitions are held and where the men meet the performance standards of the military sports program.

Specialist personnel in physical training and athletics firmly rely in their work on initive by subunit Communists and Komsomol members. Military Pilot 1st Class Maj S. Kirichenko, for example, is very helpful in the conduct of physical training activities for officers. The physical training classes he organizes are very popular with the officers, since they are conducted on a high methodological level and are distinguished by uniqueness and diversity of means employed.

Rigorous medical oversight has become an integral part of physical training activities. Flight surgeon Maj A. Ivashchenko keeps a close eye on the airmen's health. Not even the slightest deviations in performance escape his vigilant eye. He uses the most modern psychological diagnosis equipment, which enables him to specify stress loads in conformity with a pilot's

Table 1. Examples of Physical Exercises to Develop Important Flying Qualities

Qualities	Means of Development
Qualities Related to Job Performance	
Tolerance of hypoxia and breathing under over-pressure the breath, running	Swimming, diving for depth and swimming under water for distance, exercises involving holding various distances, ski racing
Resistance to hypodynamia	Ski training, distance running, static exercises
Resistance to positive G forces neck and quadraceps muscles, exercises on the 360 degree swing, on the gymnastic wheel, trampoline, 400-800 meter run	Exercises aimed at developing abdominal muscles,
Resistance to motion sickness and vibration	Rapid turning of the head in place and in motion, swimming, exercises on gymnastic apparatus, the gymnastic wheel, suspended wheel, trampoline
Fine motor coordination	Exercises involving coordinated change in position of arms and legs, free-exercise routines, athletic games (volleyball, basketball, tennis)
Reaction speed and accuracy	Atheltic games, special exercises involving change in forms and direction of movements on command, rapid change in arm and leg positions
Emotional stability	Autogenous exercise, exercises in breathing and muscle relaxation, swimming, specialized gymnastic exercises
Spatial orientation	Athletic games, gymnastics, jumping on the trampoline, diving, exercises on the 360 degree swing and gymnastic wheel
Mental and Psychological Skills	
Recall memory and thought process Attention distribution and switching Accuracy of estimating time intervals Persistence of attention	Athletic games, gymnastics, performance of exercises for a period of time and on command by one's partner, or with simultaneous performance of mental operations, such as crossing the balance beam (height 1 meter), tossing a ball into the air with one hand, while reciting the multiplication table

Table 2. Factors Slowing Improvement in Physical Fitness and Ways to Correct Them

Possible Cause	Means of Correction
Violation of the principle of systametic training	Perform physical exercises at least once every two days
Insignificant physical load	Increase intensity and duration of physical exercise activities
Adaptation of the organism to the work load or exercise	Choose new equivalent exercises or employ a uniform (stepped, fluctuating) method of increasing the physical load, or perform exercises in more difficult conditions, such as on apparatus higher from the floor, on a narrow support, in the dark, etc.
Incorrect choice of physical exercises	Change exercise, using Table 1 and organizational -methodological instructions on flight personnel physical training
The quality to be improved is at the upper limit of one's optimum development	Determine those important job-related qualities which are lagging in development and concentrate efforts on improving them
Monotony of employed training means and methods	Become acquainted with existing means and methods, select those which are most suitable for achieving fitness goals
Incorrect exercise technique	Study the technique for performing a given exercise and methods of correcting errors, learn to perform the exercise correctly

physical condition, and he recommends for physical training activities exercises which help at the given stage to increase job fitness and successfully to accomplish a combat training mission. As we see, a solution can be found to any problem, as long as the desire is there. Unfortunately it is precisely desire which some persons in authority lack.

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ADVANCES IN SOVIET SATELLITE COMMUNICATIONS

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 8, Aug 86 (signed to press 3 Jul 86) p 30

[Article, published under the heading "The Space Program Serving Science and the Economy," by S. Mironov: "Satellite Communications Systems"]

[Text] The flags of the Soviet Union and 25 foreign countries have once again been raised on the flagstaffs for the Svyaz-86 [Communications-86] international trade fair in Moscow's Krasnaya Presnya. The exhibition includes radio transceivers, teletype machines, telephones, telegraph equipment, TV sets, tape recorders, microphones, lasers, satellites, and antennas.... In short, everything which in one way or another helps us exchange information, without respect to time or distance, from postal to satellite communications.

And the Soviet exhibit is the most representative at the exhibition. Each of the 800 Soviet exhibit items demonstrates the sharply increased scientific sophistication of products, which incorporate the results of the latest research and technologies.

The capital of our homeland has once again hospitably welcomed businessmen, specialists, and scientists, all those who take part in exchange of scientific and technical information, in bringing closer together the people of different countries and continents, and in strengthening economic and cultural ties between peoples.

The most amazing thing which we constantly encounter in our daily lives and which we fail to notice, strange as it may seem, is the almost unlimited capabilities for obtaining information via space. The range of space communications includes telephonic, telegraph, photofacsimile, television and radio broadcasting. Satellite communications is impeded by no such obstacles as seas, oceans, mountains, forests, and swamps.

The establishment of satellite communications has become a vital necessity for our country, which extends through 10 different time zones and contains sparsely-populated and hard-to-reach regions. It would be virtually impossible both from a technical and economic standpoint to provide TV coverage of the entire USSR without satellite communications.

Of definite interest in this regard is that part of the Soviet exhibit which acquaints the visitors in detail with satellite communications systems and equipment in the USSR. Diagrams, murals, full-scale models, printed literature, slides and still photographs tell the story of the adoption of satellite communications in this country.

Today the Soviet Union possesses the most highly-developed domestic satellite communications system. The Orbita, Ekran, and Moskva systems are presently operating successfully in the USSR. These systems provide radio broadcasting, telephone and telegraph communications as well as TV transmissions not only to all Soviet cities but also to the majority of rural areas. The TV broadcast network, for example, today totals hundreds of thousands of microwave relay, cable and satellite communications links, almost 500 high-power and 5,000 low-power transmitters, approximately 100 Orbita systems, and more than 3,000 Ekran and Moskva stations. Approximately 90 percent of our country's population presently resides in a TV coverage area.

Molniya-3, Raduga, Gorizont, and Ekran satellites are presently operating in the Soviet multipurpose national satellite communications system. They operate in the 1-centimeter and 10-centimeter bands, with multiband relay transmitters. Molniya satellites, for example, are launched into a highly-elliptical orbit, while Raduga, Gorizont, and Ekran satellites are placed into a geostationary orbit. This combination creates reliable conditions for providing communications coverage throughout our country's entire territory in the interests of the economy and international cooperation.

The Soviet satellite communications system is evolving in the direction of improving the performance capabilities of satellites and ground stations, utilization of additional wavebands, increasing satellites' communications traffic capacity, providing new modes of communication, and expanding the network of ground stations.

Bringing Gorizont satellites into operation, for example, has made it possible substantially to broaden the communications coverage zone and increase channel throughput capacity. In particular, they service the Intersputnik system. Intersputnik communications channels carry color TV programming for two channels, radio broadcasting, telephone traffic, as well as centrally-typeset newspaper transmission. The Gorizont satellite works in coordination with Orbita ground stations and the Moskva TV system, in which comparatively inexpensive receiving stations are used (antenna diameter 2.5 m). Gorizont can provide satellite communications to ships at sea and aircraft.

The Ekran TV broadcasting system has broadened capabilities for receiving TV programming throughout Eastern Siberia and the Yakut ASSR, using simple 10-centimeter band earth stations.

Orbita system ground stations are constantly being improved. Bringing more than 150 Moskva lightweight receiving systems on-line has enabled the USSR to surpass the national networks of every other country in size of network of ground stations and total coverage area. Adoption of the Orbita-RV system -- for multichannel high-quality radio broadcast transmission and receiving in

digital form, as well as newspaper column facsimile transmission, represents a major achievement. Suffice it to say that it has no counterpart anywhere.

The USSR is a participant in the international marine satellite communications organization, which joins together 44 countries. Visitors can see a model of one of this system's centers, situated near the city of Odessa.

Just what is this marine satellite communications center (TsMSS-1)? It is an integration of two standard shore stations. One of them operates via a geostationary satellite over the Atlantic, while the other operates through a like satellite over the Indian Ocean. TsMSS-1 provides direct telephone and telegraph communications in the satellite-covered parts of the Atlantic and Indian oceans virtually with any communications user. The crews of Soviet vessels transmit information by telephone or telegraph, which the Gorizont satellite relays to the shore station. Information travels from there by ground communications channels to the end destination -- steamship company offices and crew members' families. The information flow then reverses direction. This provides a ship with constant contact with the shore.

TsMSS-1 operates with Soviet-built equipment. This includes the Standart-A marine satellite communications shipboard radio transceiver. A full-scale working model can be seen at the exhibit. These transceivers are carried on ships of at least 10,000 tons displacement. Another international system, KOSPAS-SARSAT -- operates according to the following principle: crash or emergency locator beacons (ARB) carried on ships and aircraft switch on manually or automatically in case of a crash or emergency. Satellites pick up signals from the beacon over the crash site and transmit them to receiving stations, where the signals are automatically processed to determine the coordinates of the crash location. Two types of KOSPAS-ARB emergency radio beacons are on display at the Soviet exhibit -- a marine version and a portable version.

The space section of the Soviet exhibit is both diversified and interesting. One is struck first and foremost by the fact that space research is shown in a close, specific linkage with the needs and tasks of the economy, daily, practical production needs, as well as in the interests of scientific research.

The Soviet displays show convincingly and vividly what space research is providing. Soviet satellite communications equipment on display at the exhibit is grounded on a modern scientific foundation and extensive utilization of computer equipment and microprocessors designed to automate control functions, as well as on the basis of extensive utilization of the latest technology.

The leitmotiv of the Soviet exhibit at the Communications-86 exhibition was "Space for Peaceful Purposes."

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DEDICATED OFFICER PROMOTES AUTOMATIC-MODE GCI

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 8, Aug 86 (signed to press 3 Jul 86) pp 31-32

[Article, published under the heading "Right-Flankers of Socialist Competition," by Maj G. Karpenko: "Steep Turns"]

> [Text] Gds Capt Pavel Yevseyev was awarded the Order of the Red Star and the Order for Service to the Homeland in the USSR Armed Forces, 3rd Class, for successes in combat and political training and for courage and selflessness displayed while rendering internationalist assistance to the people of Afghanistan.
>
> This officer is presently a socialist competition right-flanker in his subunit.

Green flares shot skyward over the control tower, followed by the flight operations officer's voice over the radio: "Element 51, cleared for takeoff!"

The fighters took off by twos. They were climbing steeply on an intercept.

Gds Capt P. Yevseyev acted as senior officer at the command post. Assigning tasks to the tactical control officers, he assigned search sectors and targets and proceeded to perform his job duties. He monitored the overall air situation. Plotters were rapidly marking the location of targets, while the tactical control officers were peering intently at their radar displays, trying to figure out the "aggressor's" scheme.

The voices of Gds Capt A. Proskuryakov and Gds Sr Lt I. Konotop could be heard continuously: "55 -- target heading 30, altitude..., 58 -- turn left..., 59 -- flight level...."

Guards Captain Yevseyev, observing the situation, listened to the radio communications and appraised the radar returns from the friendly fighters and "aggressor" aircraft. From time to time he felt inclined to step in and suggest a better solution, but he restrained himself. His men radioed the requisite information promptly. There were no errors in their performance, and this pleased the officer in charge, just like a conductor hearing the

well-tempered sounds of his orchestra. He deserved part of the credit. He had done a great deal to ensure that aircrews and command post officers understood each other perfectly, although the road to mutual understanding had not been easy.

Once during a practice drill, for example, Yevseyev noted that plotter A. Borzin was falling behind in his efforts to receive all data and mark them on the plotting board. The officer suggested that his comrade, more experienced specialist V. Dorofeyev, take the novice under his wing, while Yevseyev devised a method for breaking him in. It consisted essentially in conducting all training activities and drills in conditions maximally approximating actual combat, with the heavy press of time. At training drills Dorofeyev would receive information in parallel with his charge. Each would mark the air situation on a plotting board, after which the officer would compare results. This provided graphic lessons. Borzin rapidly acquired job skills and became a specialist 2nd class. Now he feels confident in any situation.

Or take the following example. Gds Sr Lt I. Konotop suggested an interesting tactic. Yevseyev liked the suggestion. The two of them calculated in detail the elements of each fighter maneuver. As a base variant they selected a situation where a fighter element finds itself in a disadvantageous position during engagement and must execute a complicated maneuver to attack the target. An active role in this was assigned to the GCI controller. On his command the fighters executed several maneuvers. This tactic was discussed with flight personnel and subsequently tested in the air. It proved fairly effective. Soon it was adopted by all the unit's aircrews.

Today one can state with confidence that Gds Capt P. Yevseyev has achieved a high degree of exeprtise in tactical control. This officer knowledgeably employs various techniques and methods, including with the aid of automated control systems. Hard, painstaking work stands behind his success.

...This airman's career did not proceed entirely smoothly. Bad luck befell him at the very outset. After completing service school he was permanently grounded for reasons of health and had to train as a tactical control officer. Some of his fellow officers were not so sure whether the lieutenant could master such complicated, critical job duties. Indeed, there were many new things for him to learn at the command post. But Yevseyev kept his composure. He thoroughly studied his job duties, his work station, and the specific features of the flight operations area. Then, with the assistance of other officers, he practiced training drills on simulator equipment. He gradually developed speed in situation appraisal, in selection of initial guidance data, and worked on gaining skills in radio communications with aircrews.

Following Yevseyev's period of probation they probably would have continued to keep him under scrutiny for quite some time if a tactical air exercise had not begun while he was on duty. Complex combat actions took place in this officer's zone of responsibility. And how better to test one's own proficiency? After all, a person's ability is determined faster by performance on the job. The lieutenant simultaneously controlled several fighters and did an excellent job. He had proven that the summit of expertise

can be achieved not only in the air but on the ground as well. After this his fellow officers gained particular respect for him.

He subsequently served as a member of the limited Soviet forces in Afghanistan. He frequently was called upon to ready helicopter landing sites and set up coordination between aircrews and Afghan subunits. He had several exciting experiences.

On one occasion, for example, a group of soldiers was making its way through mountains to a helicopter landing site. Suddenly, just as they were about to come out onto a flat area, a dushman [Afghan rebel] mortar proceeded to place rounds on them from behind a rock. Forward air controller Pavel Yevseyev was wounded by a fragment of a mortar shell which exploded close by. A paramedic gave him a painkiller shot, bandaged him, and the group moved on. When they reached open ground, subunit commander Sr Lt A. Chernozhukov, subsequently to become a Hero of the Soviet Union, said: "Call in a helicopter, man."

Yevseyev radioed the command post, and soon Capt Kh. Surovtsov arrived. Seeing his comrade, he asked in amazement: "Well, Pavel, have you changed your MOS to infantry?"

"Not quite. But my career has taken some sharp turns," replied Yevseyev.

During the return flight Pavel's leg swelled up and the effect of the painkilling drug had apparently worn off. His leg started hurting bad. After arrival back at the field, the officer was sent to a military hospital. After recovery he returned to the line.

Two months later a motorized rifle element, accompanied by forward air controller Yevseyev, was escorting a truck convoy. To the left a sheer cliff rose above the road, with a small plateau on the right. Yevseyev was sitting in an armored personnel carrier with his radio and observing the terrain. Shots rang out as the vehicle rounded a turn. Bullets whistled overhead. He was forced to jump off the APC and take cover behind a rock. Other soldiers crawled up. They assessed the situation. There was only a little exposed ground, but it would be difficult to cross. But it had to be done! They had to know where the dushman were firing from. There was no time to ponder the matter. He took off at a dead run, the others at his heels. When he was only about 3 meters from the sheltering rocks, a bullet grazed his head. Yevseyev immediately lost consciousness. When he came to, the troopers were firing at the bandits. Soon tanks arrived.

As they say, every cloud has a silver lining. After his second wound Yevseyev noted that the arrhythmia which he had previously been experiencing had suddenly disappeared. At first he could not believe it. He checked with the paramedics (there were no doctors in the subunit), who confirmed: "You could pass the pilot's medical right now, lieutenant."

A small gleam of hope ignited deep down inside. He gazed more often at the fixed-wing and rotary-wing aircraft which passed overhead.

After his return home to the Soviet Union, Guards Captain Yevseyev headed a regimental command post, but he kept thinking about flying. Pavel's wife, a district health officer, convinced that her husband's health was on the mend, helped him prepare for the flight surgeon medical board. And although the doctors at the military district hospital were extremely stringent, they concurred in their finding: "Fit for flying duty."

Days dragged by as they waited for a decision from higher headquarters. Guards Captain Yevseyev continued with his characteristic energy training tactical control officers and working to ensure that they achieved total mutual understanding with the aircrews. He instilled in the latter in turn faith in the automatic control system and demonstrated its advantages.

Learning that some of the younger combat pilots were unhappy with guidance in automatic mode, he proceeded to inquire into the matter. It turned out that complaints that commands had failed to reach the aircraft were groundless -- the reasons most frequently were one and the same: pilots had forgotten to activate the proper switch, and in the air, in a dynamic combat environment, they could only shift to the accustomed control mode. At the initiative of the command post chief, work was done with the young pilots, and their complaints about automatic control ceased.

Whatever party member Yevseyev sets out to do, he always puts himself into the task. Here at the airfield this officer has found his niche in life. He sees his life's calling in service to the homeland. He has achieved his dream after going through difficult trials: higher headquarters sent down permission for Gds Capt P. Yevseyev to fly asa weapons officer. An aviator had returned to the sky....

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UNITED STATES, NATO ACCUSED OF PREPARING FOR WAR

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 8, Aug 86 (signed to press 3 Jul 86) pp 32-33

[Article, published under the heading "Imperialism -- Enemy of Peoples," by Lt Col I. Chub: "Dangerous Maneuvers by U.S. and NATO Air Forces"; based on materials published in the foreign press]

[Text] The CPSU Central Committee Political Report to the 27th CPSU Congress states: "Perhaps at no time in the postwar decades was the world situation as explosive, and therefore as complex and inauspicious, as in the first half of the 1980's. The right-wing clique which came into power in the United States and its principal NATO fellow travelers made a sharp swing from detente to military-power politics."

The NATO bloc leaders began in earnest carrying out a long-range military construction program aimed at radical modernization of armed forces on the basis of their mass equipping with the latest and most advanced conventional and nuclear weapons systems and at total automation of command and control processes and improvement of all categories of support. The buildup of militarist preparatins has been accompanied by a substantial increase in intensity of operational and combat training of staffs and troops, including air forces, in the course of which the operation of newly-adopted weapons and military equipment is mastered, plans for preparing for and conducting combat operations are worked out in detail, and new forms and modes of strategic and operational-tactical employment of armed forces in modern warfare are sought.

Each year NATO command authorities hold numerous exercises in the European theater. The largest of these include fall exercises under the general code name "Autumn Forge," which are conducted according to an integrated plan under the direction of NATO's Supreme Allied Commander Europe. They encompass a territory extending from Norway to Turkey. More than 250,000 officers and men, tens of thousands of tracked and wheeled vehicles, as many as 1,500 or more aircraft, approximately 350 warships of various type classification, and a great deal of other military equipment frequently take part in integrated exercises with ground, air, and naval forces.

According to reports in the foreign press, the organizers of these maneuvers and exercises are testing U.S. readiness to build up American forces in

Western Europe in a crisis situation and the capability of the military forces of the NATO countries to conduct integrated combat operations involving all branches of service. The purpose of this display of power undertaken by U.S. militarist circles and countries militarily allied with the United States is patently provocational. The organizers of these maneuvers unequivocally have in mind the USSR and the other nations of the socialist community in the "imaginary adversary."

The air forces of the NATO bloc countries take active part in almost all exercises, performing diversified missions, including the missions of gaining air superiority, repelling "enemy" air attacks, providing close air support to ground forces, sealing off an area of operations, conducting air reconnaissance, airlifting troops, equipment and weapons, providing air cover to amphibious landing forces, and protecting sea lines of communication. Air forces are extensively utilized in large-scale integrated NATO forces theater operations, as well as conducting independent air operations. In the course of exercises aggressive-bloc command authorities devote serious attention to building up air forces in Europe by redeploying aircraft from the United States.

Organization, execution, and logistic support of redeployments of tactical air to other NATO European sectors are rehearsed on the process of special annual exercises (such as "Crested Cap" and others). At these exercises U.S. military authorities demonstrate a capability quickly to build up air forces in Europe, work on planning and control, test unit combat readiness phase by phase, train tactical aircrews to fight in overseas theaters, especially in IFR weather, train pilots to handle low-level missions in dense-traffic European airspace, and test the concept of "joint basing" of U.S. and other NATO nation aircraft.

Redeployment flights to Europe are principally to airfields situated in Great Britain, West Germany, the Netherlands, Belgium, Norway, and Denmark. In an emergency the Pentagon figures on redeploying up to 1,000 combat aircraft from the United States to the Central European Sector. U.S. Air Force command authorities, however, consider this number too small and are creating the requisite conditions for redeploying to Europe up to 89 tactical fighter squadrons (approximately 1,900 aircraft), including the newest types.

U.S. and Canadian military aircrews become familiarized with the airfield network, typical air routings, and study the terrain and weather conditions of the European Theater. Considerable importance is attached to low-level flight, passing off of control of aircraft from one ground facility to another, as well as aircrew operations out of airfields belonging to the various NATO countries. British, West German, Dutch, Italian, and Belgian tactical fighter aircrews also take active part in familiarization with adjacent sectors.

NATO leaders military-airlift troops to reinforce existing integrated NATO force groupings in Europe, to concentrate men and equipment in individual NATO sectors, and to build up efforts in a given area.

Typical in this respect are the regularly-held "Reforger" exercises, the purpose of which is to redeploy troops and equipment from the United States to Europe. Personnel, gear and auxiliary equipment can be airlifted, while ground combat vehicles and large field equipment can be transported by sea.

NATO air forces conduct large-scale air operations in close coordination with these ground forces as well as naval forces. Air forces of several NATO countries operate over an extensive area within a NATO sector under integrated command, independently carry out missions and support ground and naval forces.

When discussing the purpose of exercises and the missions performed by the forces involved, the bourgeois mass media endeavor to convince the public in the West of the "defensive mission" of the NATO alliance. But the war games convincingly demonstrate that training of staffs and troops places primary emphasis on accomplishing offensive missions. Not only are forms and methods of conduct of combat operations by air forces in conditions approximating actual combat rehearsed and perfected at exercises, but in addition NATO concepts on employment of fixed-wing and rotary-wing aircraft are verified and modern weapons are tested.

Thus the character and thrust of combat training of NATO troops, in which air has taken and continues to take a most active part, attest to the intentions of the bosses of this aggressive bloc to continue a policy aimed at gaining superiority over the countries of the socialist community and at disrupting the military-strategic balance between NATO and the Warsaw Pact.

A special place within the system of command and staff exercises and field training exercises is occupied by U.S. Air Force Strategic Air Command (SAC) exercises conducted under the code name "Global Shield." It is noted in the Western press that these exercises exceed in scale, scope, duration, strength of forces involved, and volume of missions performed all previously conducted events pertaining to operational and combat training of U.S. Air Force Strategic Air Command combined units, units, and subunits. Foreign observers stress that U.S. military-political leaders do not conceal the fact that these exercises not only pursue military objectives but also contain a clearly-marked political thrust -- they seek extensively to demonstrate the power and capabilities of U.S. strategic offensive forces and their ability to operate under various conditions and in any part of the world.

According to official statements by SAC authorities, the "Global Shield" exercises are designed to test the actual readiness and capabilities of ICBM and strategic air combined units and units to carry out their assigned missions as described by plans for the conduct of military operations at all levels, up to and including initiation of nuclear war. Virtually all SAC forces, certain units and subunits of the Air Force Reserve, Tactical Air Command and Military Airlift Command, as well as the Air National Guard (a total of approximately 100,000 men) take part in these exercises.

In the course of the "Global Shield" exercises, U.S. authorities stress accomplishment of four principal Air Force missions: improvement of the combat proficiency of strategic aircrews taking part in the exercise as well as the personnel of service and support, logistics, communications, and other

subunits in various combat conditions; testing and verification of the feasibility of operational plans and tactics of SAC forces in conditions maximally approximating actual combat, with the aim of drawing up recommendations for their refining and detailing; working on and perfecting of practical coordination among units and subunits within SAC, as well as with other commands; verification of the professional level of SAC personnel proficiency, combat readiness, and capabilities.

In working on these items, SAC authorties seek observance of a basic principle -- creation of an environment maximally approximating actual combat.

The "Global Shield" exercises are of a comprehensive nature. They involve such fundamental elements as dispersal of strategic bombers to alternate airfields (including civilian) and preparation for performing combat missions, airborne alert by B-52 and FB-111 aircrews on preselected routes, delivery of nuclear strikes (simulated) by ICBMs and combat aircrews on targets located on the territory of the potential adversary, organization of reconnaissance aircraft flights in support of the exercise, putting large numbers of bombers and tankers into the air simultaneously on command by the highest-level military command authority, etc.

U.S. military-political leaders seek to conceal the true nature and thrust of the "Global Shield" exercises, justifying the need to hold such exercises with a lie about a "growing Soviet threat." The concept of these exercises, however, their constantly growing scale, and the substance of the activities involved, as even some members of the U.S. press attest, constitute undisguised practical U.S. preparations to wage a nuclear world war and constitiute an instrument of a policy of "neoglobalism."

The scale of U.S. and NATO exercises, which has been increasing from year to year, has made them an important factor in deterioration of the military-political situation both on a regional and worldwide scale. In addition to a show of military might and attempts to apply pressure to democratic and progressive forces in various parts of the world which are not to the liking of Western imperialist circles, they serve as a cover for the conduct of military-political actions. U.S. military exercises and maneuvers, for example, developed into intervention on Grenada, aggression against Libya, and invasion of Lebanon. The Pentagon has repeatedly held exercises in Central America, preparing for armed provocation against Nicaragua. And they take on an unprecedented scale year by year, becoming difficult to distinguish from actual preparations for war.

All these facts confirm the conclusions stated at the 27th CPSU Congress that imperialism and imperialism alone bears responsibility for the wars and conflicts of our age, for initiation and constant escalation of the arms race, and for opening up new manifestations of the arms race.

It is precisely for this reason that the party devotes unabating attention to our country's defense capability. Tough requirements on Soviet military personnel are formulated in the CPSU Program. It stresses that the Armed

Forces shall display a high degree of vigilance and shall be prepared at all times to nip in the bud intrigues by imperialism against the USSR and its allies and to crush any aggressor.

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NAVIGATOR-INSTRUCTORS AT CHELYABINSK NAVIGATOR SCHOOL

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 8, Aug 86 (signed to press 3 Jul 86) pp 36-37

[Article, published under the heading "Military Educational Institution Affairs," by Maj (Res) A. Sirazitdinov: "Instructors"]

[Text] A principle which has long since been put to the practical test and confirmed -- "do as I do" -- a simple and rather wise principle -- presumes training and indoctrination by personal example. The instructor first demonstrates everything a student is to be taught in the air: watch me, and commit it to memory! The student then is given the opportunity to demonstrate how he has mastered a subject or assignment. But this principle applies not only to training proper and not only to flying. The instructor is a supreme authority to the student both on the ground and in the air: by his example he teaches the young man not only to fly but also to organize his life in such a manner that his aspiration to fly is embodied in a model example of observance of lofty duty.

I should like to talk about the people at the Chelyabinsk Higher Military Aviation School for Navigators.

On the third floor of the classroom building where the navigator-instructors group has its offices, I could not help but sense some unexplainable feeling which always came when I entered a classroom building even back in my officer candidate days. A classroom building is truly a temple of science. Here you have the feeling as if the difference between sky and ground disappears. I walked into a classroom. A class was being conducted in a businesslike but relaxed atmosphere. Happy faces, vigorous hand gestures, and interesting discussions. One had the sense that the men here were right in their element, as if in the air.

Lt Col V. Tumanov, head of the instructor group, turned out to be much younger than I had imagined he would be. He was short, solidly built, and quite animated. A radiant smile and expressive gestures -- he had attractive ways about him. Vasiliy Stepanovich is an interesting conversation partner, but he does not like to talk about himself. I was able to learn from him only that prior to his present assignment he had been serving as squadron navigation officer in a training regiment and that his job here involved a lot to do, but

was interesting, especially the contact with the cadets. He spoke about the officers in his group with great affection and interest! Tumanov described many of them as being exceptionally dedicated specialists. He characterized Maj S. Balashov, for example, as one of the top methods specialists. He had assumed the brunt of the job of incorporating new technical teaching devices. Balashov is in his sixth year as an instructor. Although he is still young, on the basis of his flying experience he is approaching the peak of maturity both as a navigator and as an instructor.

One must possess talent and the finest human traits in order to be such a specialist. An instructor is a molder and shaper of airmen's characters, and perhaps talents as well. Precisely this came to mind as I was listening to the group chief talk about Major Balashov.

Naturally it is more difficult to be an instructor than, for example, to fly in a line unit, where one is basically responsible only for oneself. Perhaps for this reason there are not so many persons wanting to continue as an instructor upon graduating from flying school. Maj S. Balashov is one of those instructors who derives not only satisfaction in working with cadets but also finds that this enhances his job to a genuine calling in life. He himself says that he is able to establish solid contact with the students, explaining that this is both due to luck and a communicative nature. Of course the secret of his navigation pedagogy does not lie solely in this.

...Last year Balashov had a cadet by the name of Subbotin in his group. He had successfully completed almost the entire second-year flight program, with only two training flights remaining to complete his practical flying. Suddenly the cadet fell into a fit of depression, without apparent cause. He submitted a written statement that he no longer wished to fly. Nobody could get him to change his mind, and yet he was a serious-minded lad, was familiar with military service, had voluntarily applied for admission, and was respected by his fellow students. Sergey Balashov succeeded in doing what nobody else could. He found a way to approach the cadet. He had several man-to-man talks with him, and the cadet changed his mind. Recently this instructor happened to see Subbotin, who is now a third-year cadet. He no longer has even a shadow of his former doubts.

Here is another "special case." Balashov flew with a cadet by the name of Bulatov, a tall, handsome boy. He loved flying, but he had a poor grasp of theory and lacked composure. The instructor worked with him for an entire year, making a great effort to help Bulatov successfully advance to the fourth year. Now one can say with assurance that Bulatov will be a navigator, and not he alone -- he talked his younger brother into enrolling in navigator school.

The secret of Balashov's skill as an instructor apparently lies in his deep conviction that in the process of flight training he should develop in his students not only solid professional skills but also should indoctrinate future officers. He feels that professionalism alone is worthless. It is important that when a cadet graduates he should be a man with a capital M, a genuine patriot and ideological warrior, that he should take from his

instructor all the finest things pertaining to attitude toward military service and officer competence and good habits.

Balashov has many excellent pupils. One of them is officer Lobanov, who did a fine job at a recent exercise. Several of his aircraft's navigation instruments suddenly failed. The young navigator did not lose his composure in the complex air environment and safely guided his aircraft to the destination field. Lobanov was given an early promotion in rank for his precise, knowledgeable actions and coolness displayed during this emergency.

Teaching others is no simple matter. Training air warriors is even more difficult. Each cadet has his own character and personality, and each individual responds differently in the air.

Not one of Balashov's charges has washed out of school for failing the flying part of the curriculum. This is an indication of an instructor's true talent. Stated frankly, however, he alone knows the cost in energy and nerves.

Major Balashov's military labor in training officer cadres for the Air Forces has been highly honored. He has been awarded the Order for Service to the Homeland and the USSR Armed Forces, 3rd Class.

A regimental colleague told me about instructor Maj N. Toropov. Twenty years have passed since Nikolay Aleksandrovich graduated from service school and, becoming an instructor, he has taught students all these years.

He first became acquainted with the skies in the Sverdlovsk DOSAAF Aviation Sports Club, where he took part in parachuting. He did not abandon his favorite sport upon becoming a navigator. This officer and master of parachute sport has made 1,700 jumps.

There was no forewarning of impending trouble. Once when he was doing precision jumping and trying to hit the target, Major Toropov made an abrupt control movement of his canopy and was seriously injured as he landed. Lying on a hospital bed immobilized in a plaster cast was no joke. But even more depressing were this officer's thoughts about never being able to fly again.

Toropov did return to the sky, however. He recovered completely and succeeded in convincing the strictest flight surgeon medical boards that he was capable of flying. It is indeed true that a strong will is capable of working wonders. One must love one's work very much in order to overcome such a misfortune.

In 20 years of faultless service, Nikolay Aleksandrovich Toropov has trained enough navigators to man several regiments.

Naturally one has various experiences with young student navigators who climb into the cockpit for the first time. They may give an incorrect heading, and they may confuse instrument approach facility signals. But precisely that is why the instructor is sitting alongside -- to correct the novice's actions in a prompt and timely manner. Toropov was lacking only one experience: having one of his students be unable to master navigation science. All of them are

flying, and this is the highest rating of an instructor's job performance. Officers Samsonov, Babushkin, and Lupan successfully graduated and are now doing a fine job as navigators in Air Forces units. This instructor is justly proud of such graduates.

Capt Viktor Lobanov is at the peak of his instructor's career, with experience serving with the limited Soviet forces in Afghanistan. In that country he flew several hundred missions in a comparatively short period of time. The following example is an indication of their difficulty.

They took off on a mission at dawn. Immediately following liftoff they climbed out steeply: pattern flying is not practiced here, for dushman [Afghan rebel] antiaircraft fire awaits aircraft at low altitude. Only at first glance do the mountains seem empty of life. Bands of bandits may be lurking there among the rocks, armed with antiaircraft weapons, with which they are abundantly supplied by capitalist countries. As the aircraft drew abeam of a mountain peak, the fiery trail of an antiaircraft missile was spotted out ahead. The pilot executed an abrupt evasive maneuver. One must be prepared for anything whenever flying in this country. Featureless terrain stretched out below them, terrain difficult for navigation, where there were dushman weapons in place of electronic navigation aids facilitating the navigator's job aloft. In the search area it was difficult to spot from high altitude signs of a band's presence or its weapons, but the crew spotted them and radioed the position coordinates to the ground. The dushman lair was destroyed.

Lobanov's crew flew both day and night missions. They assisted Afghan patriots and delivered urgent supplies. Men and aircraft worked as the situation dictated. The crew passed the test with flying colors. Overcoming searing heat and thirst, they took off and landed in conditions of the fierce "Afghan" wind.

Capt V. Lobanov was awarded the Order of the Red Star for successful performance and courage displayed in carrying out his internationalist duty.

Viktor Lobanov is tall, of military bearing, with a dignified but unaffected manner. This is also the way he is with his students. His charming smile and piercing gaze indicate a person of clear intellect. He is exactly how I pictured a capable instructor. Lobanov is presently completing transition training over to a new aircraft. An instructor not only teaches but is also constantly learning. Navigator Lobanov has logged a total of 5,000 hours, including more than 3,000 hours as an instructor.

When group chief Lieutenant Colonel Tumanov spoke of the instructors' work load, he named a quite substantial figure for working hours. I believe, however, that the instructors themselves are more aware of another load -- the burden of responsibility for the flight operations shift for which they are preparing and for those individuals who will represent tomorrow's aviation, mastering new altitudes and new routes.

One senses no lull in this instructor group. They do a lot of flying. The higher a navigator's proficiency rating, the more complicated in-air practice

becomes. And the instructors in this group are all rated 1st class. Student flight training is currectly in full swing. Veteran instructors officers R. Bykov, R. Bogatov, E. Parshukov, G. Yushkov, V. Kunygin and others are training young navigator cadres.

This year the Chelyabinsk Higher Military Aviation School for Navigators imeni 50th Anniversary of Lenin Komsomol marks its 50th year. Excellently-performed flight assignments will constitute a worthy contribution by the instructors group toward improving the teaching process in training highly-skilled navigators for our country's Air Forces.

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SDI WEAPONS RESEARCH REVIEWED

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 8, Aug 86 (signed to press 3 Jul 86) pp 42-43

[Article, published under the heading "The Pentagon's Orbital Arsenal," by Col A. Gorbenko and Maj Yu. Sekerin: "'Star Weapons'"; based on materials published in the foreign press]

[Text] CPSU Central Committee General Secretary Comrade M. S. Gorbachev noted in the Central Committee's Political Report to the 27th CPSU Congress: "Perhaps at no time in the postwar decades has the world situation been as explosive and consequently as difficult and inauspicious as in the first half of the 1980's." Imperialism is responsible for the serious aggravation of the international military-political situation. The monopoly bourgeoisie continues to treat socialism as an "aberration" of history and seeks to "correct" it by any means, with total disregard for law and morality, including the unleashing of another world war.

Imperialism is attempting to resolve by power politics the most important group of conflicts of today's world from the standpoint of the destiny of mankind, conflicts involving relations between the nations of two political systems. This is the capitalist world's response to development of a worldwide revolutionary process and advance by human society. "The more the course of historical development undermines the position of imperialism," states the new, updated version of the CPSU Program, "the more hostile to the interests of peoples the policies of its most reactionary forces become. Imperialism is offering fierce resistance to social advance and is undertaking attempts to halt the course of history, to undermine the position of socialism, to recoup social losses on a worldwide scale."

Seeking to recoup social losses is most typical of U.S. circles, which have elevated "crusades" against communism and "destruction of socialism on a worldwide scale" to the status of national policy. U.S. imperialists, pursuing a hegemonistic policy, do not want to accept the political realities of today's world. They arbitrarily decalre many sovereign states, entire continents and regions to be zones of U.S. "vital interests," attempt to dictate their will on other nations, and force unequal relations on them. Reactionary, antipopular regimes enjoy total U.S. support. The practice of U.S. discrimination against "disfavored countries" and gross interference in

the domestic affairs of other nations is being conducted on an ever growing scale. The U.S. press acknowledges that just in the span of two decades, from the mid-1950's to the mid-1970's, the CIA perpetrated approximately 900 foreign interventions, waged secret wars throughout the world, and has secretly dominated certain foreign governments, transforming them into virtual vassals. Such a policy on the part of the United States and its NATO partners disrupts intergovernmental, economic and political relations and hinders their normal development.

Endeavoring to regain their lost position in the international arena and to achieve total world domination, the most reactionary circles are counting on the force of arms. The greatest crime perpetrated by imperialism against peoples is the unprecedented-scale arms race it unleashed. Setting up for itself the objective of tipping the balance of military-strategic parity between the USSR and the United States, between the Warsaw Pact Organization and the NATO bloc, imperialism is sharply increasing military expenditures. The United States alone drafted an official military budget of 322.2 billion dollars for fiscal year 1986. Appropriations for military purposes will reach 488.1 billion dollars by 1990, according to the Reagan Administration's plans, and will total 2 trillion dollars for the five-year period as a whole. The bulk of these astronomical amounts is being channeled into building up the U.S. nuclear potential and developing weapons based on new physical principles.

As attested by the foreign press, research conducted in the West indicates that the technical preconditions exist for developing such weapons. Lasers in the infrared, ultraviolet, or visible regions of the spectrum, X-ray lasers with nuclear pumping, high-energy particle accelerators, and shf masers are being considered as components of weapon systems. One feature of such weapons is emphasized: the high velocity of propagation of casualty/damage-producing elements close to the speed of light. At ranges of several thousand kilometers a target's angular travel will be negligible, and this factor, in the opinion of the weapon developers, will rule out evasive maneuver and will considerably simplify aiming.

The Pentagon assigns a principal role to laser weapons. As an example, they are considering a possible version of a space-based weapon system consisting of 18 stations in three polar orbits with an effective weapon range of approximately 5,000 kilometers. A five megawatt laser would be placed on each, with concentration of laser energy achieved with a four-meter diameter mirror. U.S. experts maintain, however, that this will be insufficient power at extreme range. For this reason they are already considering ways to increase power.

Gas-dynamic CO2 lasers and HF chemical lasers with a wavelength of 10.6 and 2.8 microns respectively, operating with a hydrofluoride mixture, are being considered as laser emission sources. Chemical lasers are considered to be the most acceptable for destroying ICBMs in the boost phase. The energy source of an HF laser, which in the estimate of U.S. experts is the most promising, is the energy contained in a mixture of H2 and F2. The efficiency of modern HF lasers is 3 percent, and therefore the effective laser energy

yield will be 100 J/g. For quite some time now TRW has been working on developing a 5 megawatt HF chemical laser under the Alpha project.

A nuclear-pumped X-ray laser is being developed at the University of California's Lawrence Livermore Radiation Laboratory. This laser is a device with a large number of rods filled with a solid substance with high atomic density. It accumulates hard X-radiation, like a storage battery, following a small nuclear explosion and generates it in a pulse.

In the estimate of U.S. experts, a battle station with a laser of this type can carry a 0.1-1.0 kt yield nuclear device. Its detonation will simultaneously pump 50 2-meter rods, each of which is aimed at the target in advance. The laser beam propagates in the direction in which the rod is pointed. Energy runs approximately 10 to the sixth power J per rod. Efficiency of generation of laser emission and beam characteristics depend on the composition of the rod and nuclear charge.

In the opinion of Project Excalibur officials, each battle station with an X-ray laser could fire at 10-100 ICBMs out to a range of 500 kilometers several minutes after launch. In the opinion of foreign experts, at present no means of protection have been found against nuclear-pumped X-ray lasers, in contrast to chemical lasers, since the chemical laser's kill mechanism consists in heating the ICBM's skin, while shock-pulse effect is characteristic of an X-ray laser.

U.S. experts claim that the absence of a costly and complicated optical system is the principal advantage of such battle stations. They consider as shortcomings of a nuclear-pumped X-ray laser the fact that it can be used only once and that it will damage any space vehicle in the vicinity by the detonation of the nuclear charge which pumps the X-ray laser.

Such a laser was first tested on 14 November 1980 in an underground shaft in the Nevada desert. The U.S. magazine AVIATION WEEK AND SPACE TECHNOLOGY reported in 1983 that a power of 400 Tv was obtained from an X-ray laser during an underground test. No device operating on the earth's surface has yet produced such a power. At the same time foreign experts have serious doubts about the effectiveness of space stations with an X-ray laser. In particular, aiming and holding the rods properly aimed under the effect of a nuclear explosion are problems which have not yet been solved.

According to materials published in the U.S. press, laser emissions can be employed to destroy and "blind" many types of weapons and equipment. ICBMs, the most vulnerable points on which are the propellant tank walls, should become a principal laser weapon target. The density of laser emission required for thermal destruction of propellant tanks of liquid-propellant ICBMs is estimated at 100-500 J/sq cm. Wall thickness and strength is greater than this in solid-propellant missiles, and their damage threshold is 10-20 kJ/sq km. ICMB reentry vehicles are designed to withstand considerable heat during reentry into dense layers of atmosphere, and more than 100 MJ/sq cm is required to destroy them. This is why it is believed that ICBMs should be destroyed during the boost phase, prior to reentry vehicle separation.

Alongside space-based laser weapons, consideration is being given to the possibility of using a heavy ground-based laser in combination with mirrors of several types deployed in space. The main problem in designing such systems is laser beam passage through the earth's atmosphere without becomng ineffective. Experiments conducted at the AMOS station on Maui (Hawaii) indicated that an average-power laser beam operating in the visible region of the spectrum can pass through the earth's atmosphere. Aiming accuracy in these experiments was within the required limits. Stabilization of mirrors in space, however, remains a problem.

U.S. companies are also conducting SDI research on Department of Defense contracts on utilization of beams of charged particles (electrons or protons). For a long time the possibility of their utilization was held to be doubtful due to the considerable deflection of elementary particles in the earth's magnetic field. For example, the radius of curvature even for particles with an energy in the order of a gigaelectronvolt is approximately 200 km.

Specialists at Lawrence Livermore Laboratory discovered the possibility of conducting an electron beam along an ionized channel created by a laser beam in a partial vacuum. According to their calculations, the destructive force of such a beam would be sufficient to destroy an ICBM at a range of more than 1,500 km. It is presumed that a space station carrying on board a particle beam of this type would maintain an orbit as high as 600 km. Beam accelerators will use in the ionosphere a gas which is ionized by a laser beam. Remaining positive ions will focus the beam, which will propagate along a positive-ion channel generated by the laser beam.

Neutral atoms of hydrogen accelerated to the required energy level are extremely promising for these applications, in the opinion of U.S. experts. During interaction with residual gas in the upper layers of the atmosphere, they may lose electrons, becoming transformed into protons.

The possibility of employing considerably more compact accelerators is considered to be one of the advantages of particle-beam weapons. Damage-producing factors of particle-beam weapons include burning through a rocket's skin, melting or destroying electronic devices, and detonation of the explosive in an ICBM warhead.

Multiple-mission Space Shuttle craft are being used to develop individual components of a space station carrying a laser weapon. In the future plans call for boosting these stations, weighing approximately 72 tons, into orbit with HLLV [Heavy-Lift Launch Vehicle] boosters, work on development of which is in progress in the United States.

Prominent scientists throughout the world have incontrovertibly demonstrated the unsoundness of the doctrine of "assured survival" and the impossibility of building an absolute ABM shield. Nevertheless the Washington Administration is continuing to push the pace of militarization of space.

Practical experience persuasively confirms the correctness of the conclusion stated formally in the CPSU Program that defense of revolutionary achievements against encroachments by our class enemies is one of the most important

general principles of socialism. Today the role and significance of the economic and defense potential of the Soviet Union and the combat power of the Warsaw Pact member nations as guarantors of peace, progress, and security of peoples are increasing to an even greater degree.

The USSR is doing everything in its power to preserve peace and is seeking ways to reach mutual understanding, to limit the arms race, and to create an all-encompassing system of international security. Everyone needs peace. One must fight for peace. Through the active efforts of peace-loving countries and peoples is it entirely possible to thwart the sinister plans of those who would unleash another war, to hold in check fanciers of risky ventures and claimants of world domination, to defend peace on earth, to protect and preserve mankind -- perhaps the sole civilization in the star-filled expanses of the Galaxy.

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CLOSE-UP IMAGING OF HALLEY NUCLEUS DESCRIBED

Moscow AVIATSIYA I KOSMONAVTIKA in Russian No 8, Aug 86 (signed to press 3 Jul 86) pp 44-45

[Article, published under the heading "The Space Program Serving Science and the Economy," by Doctor of Technical Sciences G. Avanesov: "Halley's Comet on the Screen"]

[Text] At the beginning of the year this journal carried an article on preparations for investigating Halley's Comet. It would seem to be quite natural at this point to continue this topic and report on results obtained by the scientists. In addition, this journal's readers have requested a comparative description of the Vega and Giotto projects. Most frequently they ask: "Why did the Soviet probes pass at a greater distance from the cometary nucleus than the West European vehicle?"; "Why were Vega 2 trajectory corrections not used to bring the probe closer to the nucleus?"

In answer to these questions we can state that the purpose of the Soviet project was to conduct combined investigations of Venus and Halley's Comet. For this reason a standard Venera probe was employed, with certain modifications. The degree of its shielding was sufficient to accomplish the principal task of the flight to Halley's Comet -- to obtain an image of the nucleus at the pericenter and to be the first to determine its form and shape. At the same time all systems were designed with the aim of eliminating the possibility of loss of picture during a close flyby of the comet. The European Space Agency decided to take a risk, having provided special shielding for its probe. This shielding helped the vehicle survive an encounter with the comet's dust cloud, but nevertheless failed to protect its TV system. As a result the West European scientists failed to receive images of the nucleus at the pericenter.

The follwoing article reports on how the TV systems of the Vega 1 and Vega 2 probes operated, as well as initial obtained results.

The Soviet Vega 1 and Vega 2 unmanned interplanetary probes reached the vicinity of Halley's Comet on 6 and 9 March 1986 respectively. Passing through the gas and dust cloud surrounding its nucleus, they transmitted a series of "portraits" of the nucleus from various aspects and in various regions of the spectrum. The closest distance to the comet reached by Vega 1 was 8,900 km, and 8,100 km by Vega 2. A scientific instrumentation package, performing imaging and measurements in the comet-adjacent zone, achieved the final objectives of these probes' mission, which lasted a year and a half.

The principal mission objective was to obtain images of the nucleus and the nucleus-adjacent region of the comet. The importance of accomplishing this task was dictated first and foremost by the fact that the nucleus of Halley's Comet, just as other comets, cannot be observed by ground-based telescopes. And yet the dimensions of its nucleus, its form, albedo (reflectivity of the surface of a body), and parameters of rotation are important physical characteristics which are essential for an understanding of the nature of comets.

Imaging of the circumnuclear region of Halley's Comet was performed by a special television system (TVS), with Soviet, Hungarian and French scientific teams taking part in designing, building, and testing the system. Assembly and separate testing of the system were performed at the Central Institute of Physical Research of the Hungarian Academy of Sciences. It was placed on an automated stabilized platform built in Czechoslovakia with the participation of Soviet specialists.

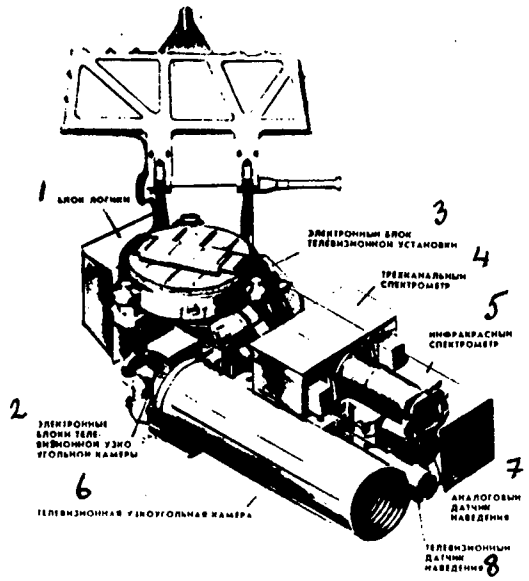

Figure 1. TV system carried by the Vega 1 and Vega 2 unmanned interplanetary probes.

Key: 1. Logic unit; 2. Narrow-angle TV camera electronics modules; 3. TV unit electronics module; 4. Three-channel spectrometer; 5. Infrared spectrometer; 7. Analog guidance sensor; 8. TV guidance sensor

Together with two other instruments (a three-channel spectrometer and an infrared spectrometer), the TVS was part of the so-called platform package -- the principal combined instrument for studying the comet's nucleus and circumnuclear region. Incidentally, the first of these spectrometers was developed by Soviet, Bulgarian, and French specialists, while the other was supplied in its entirety by France. Thus a complex digital guidance circuit was created, providing automatic detection of the nucleus of Halley's Comet and automatic in-flight tracking of the nucleus. All analytic and logic problems connected with the guidance process were real-time solved by the TVS on the basis of processing video information obtained during flight. Intervention by ground operators in the operation of the guidance loop was virtually out of the question due to the excessive (approximately 9 minutes) time required for commands to reach the vehicle from the earth, for the probe-comet linear closing velocity was close to 75 km/s, while angular velocity approached 1 degree per second at the pericenter, and the entire "critical" period of the rendezvous lasted only about 20 minutes. Consequently guidance could be handled only automatically.

The platform package also included a non-TV backup guidance sensor based on a quadrant photodiode matrix -- an analog guidance sensor (ADN). By virtue of its relative simplicity, this instrument made it possible to determine the comet's weighted center of luminance. But the position of the center of luminance depends to a significant degree on its distribution, the comet sighting angle and field of view, which generates natural guidance errors capable of leading to loss of the main object of investigation -- the cometary nucleus. These considerations, formulated at the preliminary design stage, are what dictated the backup status for the ADN instrument. It was designed and built in the USSR with the participation of Czechoslovak specialists.

A brief description of the platform package gives some idea of the scientific-technical, design and engineering problems which had to be solved by the developers of the systems in creating this package. The TVS, ADN, and spectrometric instruments were designed on the basis of certain computer-simulation derived ideas about the comet: its luminance, the size of the nucleus and gas-dust cloud, the dust environment in the circumnuclear region, and other parameters. These notions were based on data obtained by previous observations as well as on general physical considerations and calculations, which made it possible to create a probability model which was synthesized and formulated by noted Soviet astronomer Professor V. Moroz. It was also experimentally verified. Specialists designed and built the scientific package on a very tight timetable. It was necessary to design and build fundamentally new instruments and systems and perfect them in an earth environment to a degree guaranteeing that they would continue to operate in the difficult conditions of space flight. To this were added the size-weight and power limitations of the interplanetary probe. All these difficulties were surmounted. The highly-informative instruments and systems, with minimum size, weight, and power consumption, did not let the specialists down.

Here is a brief description of the TV system. Its two-camera, four-channel optics provided capability to obtain an angular resolution per pixel of 3.5 and 28.0 seconds respectively. One channel of the narrow-angle camera was

able, using interchangeable light filters, to image in six different frequency bands in the visible and near-infrared regions of the spectrum. The remaining, backup channels were used primarily for guidance and operation in the 0.63-0.76 micrometer band, where maximum comet nucleus contrast was expected.

Two microprocessor systems operated the television system. The first received commands, controlled TV imaging and processing of information transmitted to earth, while the second handled guidance. Of course redundancy was provided. A prediction of the "platform-comet" mutual displacement path was formed in the microprocessor system on the basis of processing of input video information. This information could be used if the camera channels failed. And if the attitude control microprocessor or its peripheral devices failed, there would be an automatic switchover to a backup loop from an analog guidance sensor.

One can judge how effective this strategy was by the results produced by the Vega 2 probe, when on 9 March 1986, half an hour before the point of closest approach to the comet, the TV guidance loop processor failed (see photo) [not reproduced].

From the moment Vega 1 and Vega 2 were launched in December 1984 up to February 1986, the scientific platform package, including the TVS, was in en-route travel mode. Only TV system operation and calibration were checked about every two months.

From 14 to 22 February 1986, after the platforms were switched to operational mode, the TV system obtained images of Jupiter, its Galilean moons and Saturn, for the purpose of testing the sensitivity and image quality of the TV cameras, as well as to refine referencing of the platform axis system to the inertial coordinate system. Imaging was repeated from both probes on 26 and 27 March 1986 following the comet flyby.

According to the program, imaging of Halley's Comet by Vega 1 and Vega 2 commenced on 4 and 7 March 1986 at a distance of approximately 14 million km; subsequently daily sessions were conducted right up to 11 March 1986.

The TV system operating program can be subdivided into several phases. In the first phase the imaging angle remained virtually unchanged, and the nucleus did not change. The second phase began at a distance of 90,000 km (20 minutes to point of closest approach to the comet) and was characterized by an increase in the linear dimensions of the nucleus image. In the third phase, beginning at 50,000 km, changes in imaging angle and phase angle increased rapidly, while the dimensions of the nucleus iamge reached a maximum. Similar phases occurred at the stage of recession from the comet.

The mission program prescribed imaging both with automatically determined and fixed exposure time in various spectral frequency bands. To reveal morphology of the coma when imaging at distances greater than 50,000 km, for example, for 30 percent of the images the exposure time was increased by a factor of four relative to automatic determination. The total number of images obtained during the experiment is about 1,500.

The information obtained during the experiment is so extensive that several years will be required to process it fully. But initial results enable one to shed some light on the characteristics of this space wanderer. Its nucleus is irregular in shape. Its maximum diameter is approximately 7 km, and its length is about 14 km. Its axis of rotation is close to the axis of maximum moment of inertia and lies within a cone of plus or minus 30 degrees perpendicular to the plane of the ecliptic. The albedo of the nucleus is close to 0.04, that is, 4 percent of the incident radiation is scattered in all directions. The imaging materials will make it possible to reconstruct a three-dimensional model of the nucleus and to determine the configuration of the jets.

Now a few words about the European Space Agency's Giotto probe. It was given this name in honor of the famed Italian artist who depicted on a fresco the appearance of Halley's Comet in 1303. During the night of 14 March 1986 Giotto passed at a distance of about 600 km from the cometary nucleus. Its flight path was adjusted on the basis of the actual figures on the flyby of the Soviet Vega 1 and Vega 2 interplanetary probes. The international program of joint efforts to refine Giotto's path was given the name "Pilot Concept." The culmination of this program was the fast processing of data based on the viewing angles of the cometary nucleus by the Vega probe's TV cameras. Twenty-four hours after flyby, these data were transmitted to mission control center at Darmstadt (FRG) and used to adjust the flight path.

The Giotto scientific instrumentation package included a TV camera which transmitted to earth a series of images, initially of the comet and subsequently of its nucleus as well. They were able to obtain images only during approach. Upon entering the comet's gas and dust cloud, the vehicle began to nutate. As the vehicle approached the comet, it became increasingly difficult for the guidance loop to counter the nutation. As a result, imaging of the nucleus ceased at a distance of approximately 2,000 km. Attitude control of the vehicle and communications with it were lost 2 seconds before pericenter. Attitude control was restored after flyby, but the TV camera had become disabled, and it was not possible to estimate degradation of its imaging characteristics based on observations of Jupiter, as has been planned.

In conclusion we should note that the success of the missions to Halley's Comet by the Soviet and European space vehicles constitutes not only a scientific and technological advance. It is a vivid demonstration of the effectiveness of international cooperation in the area of peaceful exploration of space and an example worthy of further development in organizing and conducting future, more complex and larger-scale space projects. It is an example which confirms the vital strength of Soviet peace initiatives. We must enter the 21st century without nuclear arms but with an ambitious program of peaceful exploration of space.

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NIKOLAYEV DISCUSSES COSMONAUT TRAINING

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[Article, published under the heading "Cosmonaut Training," by Twice Hero of the Soviet Union Pilot-Cosmonaut USSR Maj Gen Avn A. Nikolayev, first deputy commanding officer, Cosmonaut Training Center imeni Yu. A. Gagarin: "New Profession of the 20th Century"; concluding part of a two-part article -- see No 7, 1986]

[Text] An important aspect of the cosmonaut profession is its research nature. Today experimentation activities are comprising an ever increasing share of crew activities in orbit. It is for good reason that the Salyut orbital stations are called comprehensive research laboratories. This is the cosmonauts' workplace, where they labor in the interests of science and technology, performing tasks of economic significance. Leonid Kizim, Vladimir Solovyev, and Oleg Atkov, for example, performed approximately 500 research tasks and experiments on board Salyut 7: medical-biological, industrial and technical, astrophysical, study of the Earth's surface and atmosphere, testing and development of improved systems and instruments. Considerable attention in crew work activities was devoted to study of Earth resources and environment.

It is appropriate to comment at this point that on an extended mission a cosmonaut is constantly improving his skills as an investigator. For example, the ability to conduct from orbit observations of the Earth, ocean, and Earth's atmosphere is generally acquired after one or two months, for it is not yet possible on Earth to teach a person to conduct such observations (nor are there teachers available). By continuously participating in such observations, a cosmonaut learns to select optimal conditions for recording a phenomenon and to interpret it correctly.

Today's cosmonaut is a broad-specialization researcher. He is not simply an executant of prescribed actions but frequently takes part in improving and perfecting methods and in correcting and adjusting them in conformity with new conditions, taking into account all specific features of the mission. In short he performs innovative, active work grounded on profound knowledge, ability, and experience. Such activities require not only professional skills but also specific qualities.

A description of the cosmonaut profession would be incomplete if we failed to mention its national and social significance as well as public interest and attention toward it. As we know, each mission is of overall national significance and attracts the attention of the people of the entire world. The social significance of the cosmonaut profession is determined first and foremost by the value of the results obtained by the crew, which performs numerous scientific, technical, and economic tasks for the benefit of man and for the sake of world peace. The cosmonaut's labor culminates the work of many thousands of specialists of various areas of specialization. For this reason a strong feeling of responsibility and civic duty is an integral trait of persons of this profession.

I should like particularly to stress that the character of the Soviet cosmonaut is formed and shaped in the collective on a foundation of Communist moral and ethical principles. One of the primary tasks performed by administrators and the party organization at the Cosmonaut Training Center is to instill in the cosmonaut a striving toward lofty social goals, ideological conviction, and a genuinely innovative attitude toward labor.

It is virtually impossible for a cosmonaut to acquire actual working experience in the training process. For example, it is impossible to reproduce the effect of the powerful factor of weightlessness, which has no counterparts on Earth. It is therefore necessary to proceed by the path of acquiring professional knowledge and forming abilities and skills, utilizing an activities model which is as close as possible to the real thing, reproducing corresponding emotional and psychological stresses in the process of training activities. Hence the comprehensive nature of training cosmonaut crews and the diversity of its means and methods. Of great importance in forming and shaping the cosmonaut as a researcher and investigator are training sessions in the flying laboratory, on the centrifuge, in the altitude chamber, and in the anechoic chamber, in which specific factors of space flight are simulated, and conditions are created in which a crew learns to function in various climatic and geographic zones after landing.

Four years of operation of the Salyut 7 scientific station in orbit is one of the evidences of the reliability of our space hardware. Missions beyond the Earth, however, will continue to be difficult and dangerous for quite some time to come. Emergency situations are also a possibility. For example, the automatic attitude control system failed in the concluding phase of the Voskhod 2 mission. Mission commander Pavel Belyayev displayed a high degree of professional skill. Using manual control, he returned the reentry vehicle to Earth. The vehicle landed in forested terrain not far from Perm instead of where it was scheduled to land. Or take another incident. On 5 April 1975 cosmonauts Vasiliy Lazarev and Oleg Makarov made a forced landing in mountain terrain due to problems with the booster rocket engines.

These facts indicate that a crew should be capable of coping with difficulties on their own, prior to the arrival of search and rescue teams. In order to teach a cosmonaut to survive and maintain the capability to function in extreme conditions, using emergency stores, parachute, descent module and field-expedient means, special training activities are conducted. Instructors

inject all kinds of surprises, but the essential point remains unchanged -- training and preparation to surmount any and all difficulties, psychological and physical conditioning.

Training activities are conducted in all weather, in desert, taiga, mountains, steppe, and on water. A cosmonaut crew, for example, is landed by helicopter onto a searing sand dune. The mission is to survive with minimal gear and with extremely meager rations, and to make their way to the camp where the doctors and testing personnel are situated. A cosmonaut must know how to parcel out his energy and water supply properly and to shelter himself from the oppressive heat and sandstorms. And if the descent vehicle makes a water landing, he must be able to get out of it quickly and float in such a manner as not to be overwhelmed by the swell. The shallow-water diving suit serves as an inflatable liferaft, as it were. It is best to lie on one's back with one's head pointed toward the swell. In this position it is easier to fire a signal flare, to get food out of the emergency kit, and it is easier to handle the swell.

As we see, success in such training activities depends to a maximum degree on knowledge, mental quickness, and experience.

In the process of his job training, the cosmonaut learns to operate the spacecraft and orbital station, to operate and maintain spaceborne systems, and to perform scientific and technical research and experiments. He trains his system to adjust to the factors of space flight. And, finally, the cosmonaut's individual personality is formed and shaped and his psychological mission readiness is developed in the process of training.

Training for a multiple-crew mission has specific features. We shall examine them with the example of the third host crew (L. Kizim, V. Solovyev, and O. Atkov).

First of all it was necessary to train several crews (including backup crews). Second, differences in mission programs had to be considered. The principal crew performed a large volume of work activities and unloaded five Progress spacecraft. Kizim and Solovyev performed six EVAs, totaling 22 hours and 50 minutes, a first in the manned space program. An international-crew mission program devised jointly by Soviet and Indian specialists included eight experiments in space medicine, materials science, and remote Earth sensing. The activities program for the short-mission crew of Vladimir Dzhanibekov, Svetlana Savitskaya, and Igor Volk was also heavily packed.

Third and finally, it was necessary to time-coordinate tasks pertaining to smoothing coordination between the principal crew and the two short-mission crews. All joint orbital work schedules were successfully accomplished.

Thus the present cosmonaut training system at the Cosmonaut Training Center imeni Yu. A. Gagarin has been established and tested over many years of practical experience. In determining types and phases of training as well as their content, Cosmonaut Training Center scientists and specialists addressed diversified problems of organization and methodology of conduct of cosmonaut professional training. On the one hand the future orbital station research

worker must develop many complex skills and acquire knowledge in scientific and technical subjects. On the other hand all this must be done as rapidly as possible, for otherwise training stretches on for years, and skills are gradually lost, which makes repeat training activities necessary.

We have already stated that various professional skills and abilities are required of a cosmonaut. It would seem simpler to increase the number of crew members and send a team of narrow-specialization individuals to a space station. This is out of the question, however, due to the design characteristics of today's spacecraft.

It is not possible fully to reproduce on Earth all the conditions and adverse factors of space flight. Therefore as a rule they are simulated separately. For example, training sessions in orientation, spacecraft control, servicing, maintenance and repair of spaceborne systems, and activities involving all modes of communication are conducted on simulators. Simulation of weightlessness is more complicated. During aircraft flight in a parabolic trajectory, the cosmonaut is subjected only to brief-duration effects of weightlessness. Therefore a weightlessness simulation tank is used. Cosmonauts, wearing spacesuits, work on an orbital station mock-up in the weightlessness simulation tank, practicing EVA procedures. Vladimir Lyakhov and Aleksandr Aleksandrov, for example, practiced installing additional sections on the central solar panel. Vladimir Dzhanibekov, Svetlana Savitskaya, Leonid Kizim, Vladimir Solovyev, Viktor Savinykh, and other cosmonauts practiced using and manipulating tools in immersion-simulated weightlessness.

Individual factors of space flight are simulated with the aid of special mechanisms: the effect of G loads is simulated on the centrifuge, pressure drops in the altitude chamber, and the effect of bounded space and sensory "starvation" in the anechoic chamber.

Cosmonauts view films showing crews working on previous missions and listen to recordings of their conversations with Mission Control.

Simulators are the principal cosmonaut training devices. The principles of their design, construction, and use have been discussed in this journal. I shall merely emphasize that simulators should provide cosmonauts with information via visual, auditory, tactile and other channels in sufficient quantity and quality that the images of conditions of orbital flight and spacecraft formed correspond to actual conditions to a maximum degree.

The profession of cosmonaut was born on the cutting edge of scientific and technological advance. All scientific and technological advances are utilized in the space program. The very conditions of working in space have demanded application of the very highest level of technology in designing and building orbital stations, satellites and scientific apparatus. At the same time there is likely not one single basic science which has not been greatly influenced by space research.

Our magnificent plans to speed socioeconomic development can be accomplished only in conditions of peace. As regards the conquest of space, the Soviet

Union's policy in this matter is crystal clear: space should be a zone of cooperation for the benefit of all mankind, not an arena of military rivalry.

"We are against weapons in space," stated CPSU Central Committee General Secretary Comrade M. S. Gorbachev in a declaration on 15 January 1986. "Our material and intellectual potential give the Soviet Union the capability to develop any weapon if we are forced to do so. But we are aware of the full measure of responsibility to the present and future generations. It is our deep conviction that we should enter the third millenium not with a "star wars" program but with magnificent projects for the peaceful conquest of space by the efforts and resources of all mankind. We propose practical efforts to draw up and implement such projects. This is one of the most important ways to ensure progress on our entire planet and the forming of a reliable system of security for all."

The USSR adheres unwaveringly to this policy. Soviet cosmonauts -- bearers of the lofty ideals of humanity, courage, and spiritual beauty -- will always be worthy of their people, who were the first to build a road into space.

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